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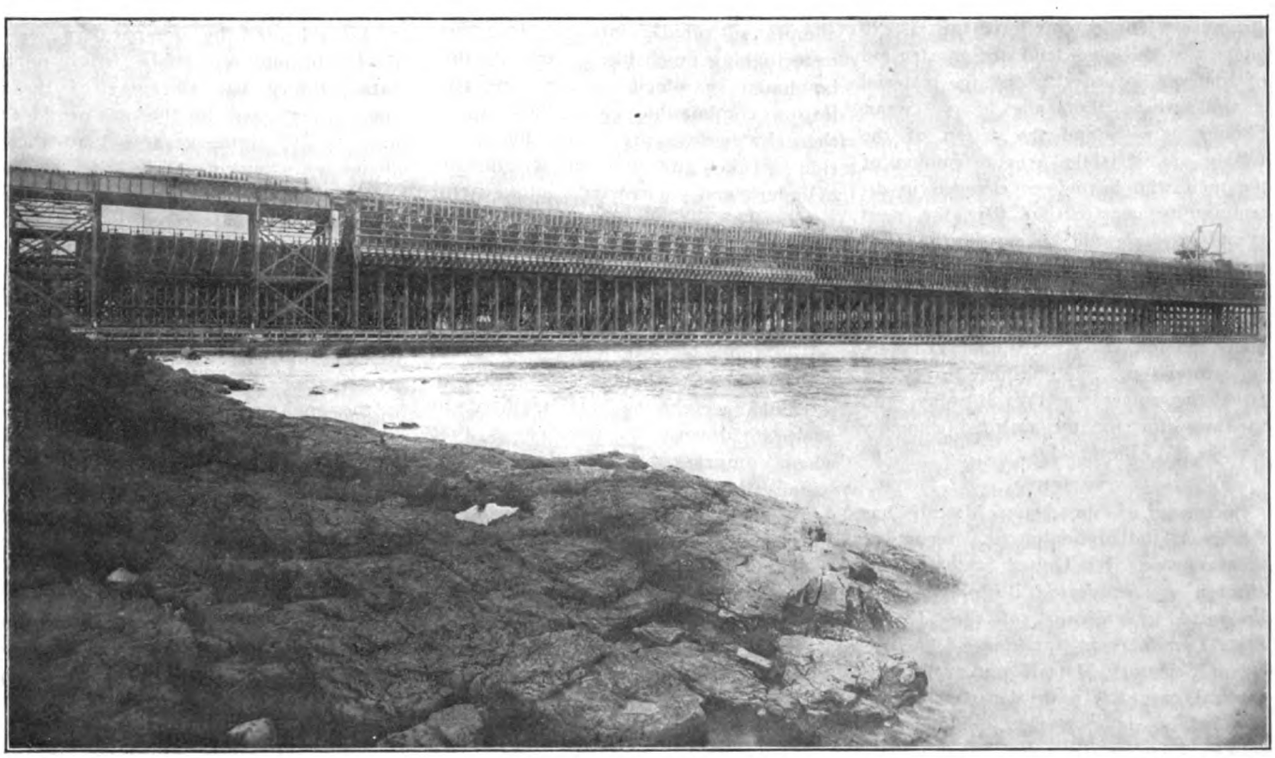
NEW ORE DOCK AT TWO HARBORS.

Dock No. 6, the latest addition to the ore docks of the Duluth & Iron Range Railroad Co. at Two Harbors, which has been under construction during 15 months past, is now nearing completion, and went into commission on Oct. 28.



THE DULUTH & IRON RANGE RAILROAD CO.'S NEW ORE SHIPPING DOCK AT TWO HARBORS.
Photo by A. P. Overland, Two Harbors, Minn.

This mammoth structure, built of steel, cement and timber, was constructed at a total cost of about $1,125,000, and is probably the most modern and up-to-date, as well as the largest, structure of its kind in existence.

The dock has a total capacity of 45,000 tons of ore. There are 74 pockets on each side, each pocket having a capacity of six steel cars of ore of 50 tons each, or 300 tons.

The first step in the building of this structure was the construction of cribbing, in which a total of 3,000,000 ft. of timber was used. These cribs were then towed in place and piling driven inside; 4,500 piles, containing a total of 300,000 lineal ft. were used. In order to support the piling the cribs were filled with rock. In this work 45,000 cu. yds. of rock were used. This rock was quarried out of the side of the hill near the dock.

The building of concrete piers was commenced at 4½ ft. below water level and continued 4½ ft. above, making them 9 ft. thick and 18 in. wide. There is a total of 11,100 cu. yds. of concrete construction. Below water the combination was what is known as 1-2-4 and above water 1-2½-5. A total of 54,000 sacks of concrete was used in the work, and the rods and anchor bolts for the steel columns were set in the concrete. This work was all done last winter, being completed about March 1, this year.

The steel portion of the dock was erected by the American Bridge Co., and required 7,500 tons of steel, of which

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there is between 700 and 800 tons in the approach and 6,900 tons in the dock proper. During the process of construction 240,000 field rivets were driven in the steel.

Over 2,000,000 ft. of lumber, mostly Washington fir, was used, of which there is 1,500,000 ft. in the pocket linings and deck, 200,000 ft. of maple in the pocket bottoms and 200,000 ft. in the approach.

The pockets are 12 ft. wide from center to center of partitions, or 11 ft. inside. They are 30 ft. in depth at the outside and 3 ft. in the inside, averaging about 15 ft.

The dock proper is 888 ft. long, with 50 ft. additional in the end bent. The steel approach is 329 ft. long and the timber approach 400 ft. To the base of the rails the dock is 73 ft. above water level, being 6 ft. higher than dock No. 5. The spouts are heavier than those on the other docks. The work was started a year ago last August and the time and money spent in its construction indicate the mammoth proportions of the structure. The partitions in the last 10 pockets at the outer end are constructed of concrete, in order to give the material a trial where there is heavy wear. Should it withstand the action of the falling ore, it is the general opinion of the men who have been engaged in directing its construction that the next great ore dock will be entirely of reinforced concrete. The Barnet & Record Co. had the contract for the timber, concrete and crib work, and this has been under the direction of William Bryden, superintendent. The engineer in charge from the outset was W. B. May, and the inspector for the railroad company was J. M. Elliott.

Secretary of the Navy Metcalf has expressed indignation at the report of the exclusion of a United States marine from a synagogue in Boston because he wore a uniform of the United States service. In speaking of the incident Secretary Metcalf said: "In this especial case the navy department, unfortunately, is powerless. I do not believe, however, that the American people will tolerate these conditions much longer. We have numerous cases brought to our attention in which sailors in uniform have been refused admittance to places of amusement. I never expected, though, to see the uniform thrust from a place of worship."

The steamer Sacramento, which was sunk in collision with the steamer Mataafa at Duluth recently, will be docked at Superior.

THE RISE OF THE GAS ENGINE.

BY LEWIS NIXON, IN *American Industries.*

The American public is so used to startling developments, that when one presents itself which involves a process of evolution even though sweeping in its effect, the people must be educated up to a realization of what is doing before giving it any general recognition.

The latent energy of fuel has been used in so wasteful a way as to alarm scientists. No greater change making for the conservation of such energy has engaged the attention of the engineering world than the gas engine. Every school boy learns of the losses in the steam engine and the small proportion of the heat value of the coal that is converted into useful work. Besides this, we have questions as to the proper water to use in the boiler and the quality of coal used in the furnace.

The gas engine combination that is coming so rapidly into use is a furnace looking much like a vertical tubular boiler in which coal is converted into a combustible gas. This gas is then drawn into the engine by a suction stroke and burned within the cylinder and converted into useful work. The action of the ordinary gas engine is easily explained in non-technical terms by an example.

Let us set a spiral spring on a table. Now if we press down this spring and release it, it will, disregarding friction and heat losses, push up as much weight as was required to push it down. Suppose now that when compressed we could suddenly stiffen the spring. It would then lift more in opening out than was required to compress it and the difference will be a gain in useful work.

We draw in a piston full of air with some gas. The piston compresses this mixture just as we compress the spring, when compressed by means of an electric spring we burn the gas and heat the whole compressed mixture. This gives it a greater pressure, or stiffens the spring, and drives the piston back with greater force than was required to compress the cooler mixture.

So we gain a far larger part of the heat value of our fuel by burning it right in the cylinder, where it is converted into useful work than by burning under a boiler where there are losses in ash, in smoke, in radiation and in leakage as the steam passes to the engine. Then coal and other fuels that are inefficient in a boiler's furnace can produce a good gas so that coals and lignites now considered of doubtful value can be used in connection with the gas engine.

The following from the report of the United States Geological Survey is most enlightening on this point:

"It will be necessary to test a larger number and greater variety of coals and lignites, and to repeat with greater care some of the tests already made, before a full discussion of the results of these investigations can be properly entered upon or their value fully appreciated. But the results already obtained from the preliminary investigations made during the last six months are sufficient to indicate their far-reaching importance in the solution of the fuel and power problems upon which the varied industries of the country depend.

"Most of the American bituminous coals and lignites can be used as a source of power in a gas-producer plant.

"As indicated by comparative tests of 14 bituminous coals from mine states, the power efficiency of these coals when used in the gas-producer plant is 2½ times greater than their efficiency when used in the steam boiler plant; or, in other words, one ton of these coals used in the gas-producer plant has developed, on a commercial scale, as much power as 2½ tons of the same coal when used in the ordinary steam boiler plant.

"The value of the results of these investigations is, of course, not limited to the coal-producing sections of the country, but extends through every state and territory where coal or other mineral fuel is used as a source of power. Thus, in the New England states no coal is mined; but in the year 1900 the steam power produced through the consumption of coal and used for manufacturing purposes in these states cost approximately $50,000,000. The development of this power through the more efficient methods suggested by these investigations would mean a saving to the manufacturers in these states of 15 to 20 million dollars per annum.

"As another illustration of the way these investigations may influence the affairs of the nation as a whole, it may be stated that there were used in the naval vessels of the United States in 1903 approximately 500,000 tons of coal, costing $2,500,000. If the future gas producer and gas engine can be substituted in our battleships and cruisers for the existing steam boilers

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and engines, the saving in the cost of coal would be not less than $1,000,000 per annum, or what would be of far greater importance, the distances traversed by each ship without coaling would be more than doubled."

That the great savings made with the gas engine are not laboratory results, the following practical application will show:

An illustration of the economies possible through the use of a gas engine driven pumping unit, when replacing steam, is the Poughkeepsie (N. Y.) pumping plant, rebuilt in 1905, with a 10-in. centrifugal pump, belted to a 35-H. P. gas engine, taking fuel from a Wood suction producer. Let the 1905 annual report of the board of public works speak for itself in regard to this:

"In the three months, January, February and March of this year, the steam plant pumping to filters used 223.59 tons of coal for 199.7 millions of gallons of water filtered, equal to 1.12 tons per million gallons. In the five months, July to November, inclusive, the gas plant used 78.16 tons for 317.8 million gallons filtered, equal to 0.24 ton per million gallons—a saving of 0.88 ton per million gallons. As an average of 63.5 millions of gallons were filtered per month, the difference in favor of the gas plant was 55.88 tons per month, costing in the shed $3.26 per ton or $182.16 per month."

The total cost of this plant—gas engine, producer, pump, foundations, piping, etc.—was $3,940.

It will, therefore, be seen that the coal saving alone paid for the entire plant in 22 months!

A similar result to this is found in numerous plants now in successful operation throughout the United States and Europe.

It must not be assumed that coal is the only fuel from which we may obtain a gas. Wood coal producers are in use in Mexico, where they give most satisfactory results. Gas can be made from petroleum, straw and charcoal that gives excellent results in gas engines. About 2½ lb. of dry wood will produce about the same value in gas as 1 lb. of coal.

The development of the gas engine has progressed much farther in America than in Europe in the marine types. The Standard Co. has built engines of 500 H. P., one in the schooner Northland, of 4,000 tons capacity, and one in the excursion fishing boat Arion, which has a speed of 18 miles an hour.

A 350-H. P. engine has just been sent to France and four engines have been tested and given remarkable results for the Austrian navy. Japan has two engines of 350 H. P. each in submarines. Russia has 7,000 H. P. of American engines in torpedo boats. The revenue cutter service fleet of vessels inaugurated by the United States for San Domingo have gas engines.

The gas engine is the logical means for generating power for marine uses in the future, and from the steps already taken to equip vessels of different classes, it is only a question of time before the suction gas producer is universally adopted for both land and sea.

DELAYS PREVENT GRAIN EXPORTS.

New York steamship interests were somewhat surprised to learn recently from Special Agent Davis, who is in Europe investigating shipping conditions, that Hamburg is receiving large quantities of wheat and feeding stuffs from the republic of Argentina, and that this is the direct result of the delays experienced in receiving these cargoes from the United States. He says:

"The official statistics of the port of Hamburg, which have just been published for the year 1907, present some features of interest especially to millers of wheat, rice and corn. A few of the more important items of grain, flour and animal feeding stuffs imported via Hamburg are given below with the figures, showing increase or decrease, as compared with 1906. The table is in units of 100 kilos (220.47 lbs. each, or 'doppelzentner,' as the unit is termed).

"The influence of the local flour-milling industry on the wheat imports may be observed in the rather remarkable increase for 1907 of 3,383,464 doppelzentners of wheat, equal to 12,406,034 bush. That this increased import of wheat was not due to any considerable shortage of home supplies is evidenced by the fact that the receipts of wheat at Hamburg from the interior by river, canal and rail in 1907 were only 400,000 bush. less than in 1906. More than three-fourths of all the wheat imported came from the United States and Argentina, the former supplying 10,830,000 and the latter 10,325,000 bush. of the 27,600,000 bush. imported. The money paid for the American wheat exceeded that paid for the Argentine product, as shown by the statistical report, by 6,210,960 marks, equal to $1,490,000, although the quantity was only 505,000 bush. in excess. The Hamburg miller or importer paid on the average $1.01 per bush. for American wheat, as against 91 cents per bush. for Argentine. Russia furnished 2,712,000 bush. of Hamburg's imports, Roumania 1,740,000 bush., and the United States Pacific coast 827,000 bush., while Australia sent 670,000 bush. Shipments from other countries were unimportant. Canadian wheat, like all other Canadian products in German trade, cut but a small figure in Hamburg imports, Canada's total contribution in 1907 being but 15,500 bush. and none in 1906.

ARGENTINA'S LEAD.

"Argentina is so far in the lead in shipments of feeding stuffs and offals into Germany, as shown by the published Hamburg imports for 1907, that I have made some extended inquiries into the reasons therefor. The fact that the exporting in Argentina is in a few hands, and that the largest wheat exporting house there is thought to be interested in the operation of the largest mills, tends to centralize the business and to offer exceptional opportunities for distribution at this end. The financial connections of Argentina's wheat exporters are well known to be very strong, as indeed they must be to handle the large volume of exports going from that country. The shippers of mill feeds there sell on seaboard bill of lading and guarantee full outturn and sound delivery at destination. These terms are attractive to buyers as against American c. i. f. terms, which buyers claim do not fully protect them against unsoundness on arrival. However, it should be noted here that once there is accomplished the necessary reform in transportation from the United States to Europe, by which needless delays are avoided, the preference now given to Argentina by the guaranteed arrival terms will be of comparatively little importance. The possible time from the United States to Hamburg is so much less than from Argentina that once reliable schedules are effected American exporters will regain the preference naturally theirs for various reasons.

EFFECT OF SHIPPING DELAYS.

"The importance of getting shipments off on contract time and the avoidance of delays is especially felt by those buyers engaged in distribution to interior German points as the winter season approaches. So much is sent out by canal and river that contracts for such delivery cannot be shifted to rail delivery without great

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loss in event the arrivals from America are not in hand before navigation closes. This generally occurs about the middle of December and the closed season continues until the first or second week in March. The difference between the water and the rail rate is where the trouble comes in. Importers may have the goods sold on basis of water rate which may not be to exceed 2 cents per 100 lbs. for a distance of 200 miles, whereas the rail rate may be 30 cents per 100 lbs. The difference in the cost of inland transportation, $5.60 per ton between the two methods of distribution in such a case, is of course, not met by any possible profit, and the need of reliable means of delivery naturally forces itself into the situation.

"The shipment, as flour, of a low class feed in order to secure a more favorable classification for export purposes would be a mistake, although sometimes it has been done to the loss and discomfort of buyers on this side. Almost any form of deception in shipping is liable, quite liable, to be discovered on arrival, when there is trouble to adjust the matter in conformity with customs regulations."

WAR VESSELS ON THE OHIO.

Strange as it may seem, gunboats, ironclads, war schooners and light-draught monitors were actually constructed and put together on the banks of these rivers, the boat yards forming veritable hives of activity at such times as the War of 1812, the Mexican War and the greater conflict of 1861-64. Even prior to the War of 1812 war vessels were built in Pittsburg.

Boat building is beyond doubt the oldest industry of Pittsburg. At a time when the country swarmed with Indians, hundreds of canoes were turned out here and later, when the Indian trader and trapper came to the "Forks of the Ohio," he built rude flatboats to transport his furs and peltries down the river. Boat yards were established as early as the Revolutionary war, a large number of barges being constructed in 1777 for army use at a point just above the mouth of Turtle creek. Boat building for the United States navy began in this city more than a century ago.

When war with France was imminent as the result of Napoleon's high-handed actions in closing the mouth of the Mississippi to American commerce and travel the galley President Adams was begun here on May 19, 1798. It carried General Wilkinson, commander-in-chief of the United States army, down the Ohio on June 8 of that year, being built in record time. Shortly after this the keel of a second galley, the Senator Ross, was laid out, but the galley boat was not launched until the spring of 1799. As war with France did not occur these vessels did not see any service.

It appears from the accounts of those early days that the chief boatbuilders for the navy at this place were Tarascon Brothers and James Bethoud & Co., both firms having yards at this point. In the year 1804 many brigs, schooners and other vessels were on the stocks of these firms, and in the same year the Conquest, a schooner, was launched from the yard of Capt. Eliphalet Beebe. It was of 126 tons, and was pierced for 16 guns, so it was quite a formidable craft. It sailed for the West Indies under the command of Capt. Kenny, and was heavily armed and well supplied with a crew, so it would clean out the pirates that then infested those waters and which played havoc with Pittsburg cargoes and ships. General James O'Hara, grandfather of the late Mrs. Schenley, owned several merchant vessels, one of which fell into the hands of Spanish pirates operating in the Caribbean Sea.

The next great period of war activity was when the Mexican war broke out when six vessels, two war steamers and four revenue cutters, were built here. The war steamer Michigan was barque rigged, and the war steamer Allegheny ship rigged; four others, the Bib, Hunter, Walker and Jefferson, were schooner rigged. It seems strange indeed at this late day to hear of sailing vessels built and launched in this city, for there is now no craft with spars and rigging turned out in this section.

During the Civil war a number of ironclads or gunboats were built here, the Manhattan, Marietta, Sandusky and the Manayunk. The ironclad monitor Manayunk measured 225 ft. in length, 43 ft. beam, and drew 12 ft. of water. Its burden was 120 tons, and had a speed of 12 miles an hour in still water. The Manayunk was towed down the Ohio on March 6, 1865, having broken loose from its moorings the night before, but without any mishap, although it floated three miles or more.

Among the unique war craft fitted out in this port were the rams or ordinary steamboats made ironclad by plates of boiler iron and the pilothouse and other parts protected by walls of heavy timbers. These were attached to the flotillas of gunboats on the Mississippi that performed such good service at Vicksburg and other places during the war.—*Pittsburg Dispatch.*

RECENT ADVANCES IN STEAM TURBINES.

BY GERALD STONEY, B. E., M. INST. C. E., M. I. E. E.*

The progress of the steam turbine is to be seen in all directions, and one thing which is especially remarkable is the rapid increase in size. Eight years ago the largest one made, which was considered an immense machine at the time, was for only 1,000 kw., and now there are large numbers ranging from 5,000 to 8,000 kw. running and under construction.

Steam turbines of large size may be roughly divided into two classes, comprising, firstly, the Parsons turbine, in which there is both action and reaction, and the expansion takes place in the fixed blades, the velocity of the steam being taken up without expansion by the moving blades. This latter class can then be sub-divided into those in which at each stage there is only a single row of moving blades as in the Rateau and Zoelly turbines, or one in which there are several rows of moving and fixed blades in each stage, which take up the velocity without any additional expansion, as in the Curtis. There are again various combinations, consisting of mixture of one or more classes, but none of these have, as yet, been manufactured to any large extent. The oldest type, and one which is more in use than any other, is the Parsons, but in America the Curtis has been manufactured in large numbers, and on the Continent the Zoelly, Rateau, and A. E. G., although both in America and on the Continent the Parsons has taken a leading position.

THE TURBO DYNAMO.

Hand in hand with the development of the steam turbine has gone the development of the various machinery to be driven by it, and in this direction electrical machinery has been prominent. For many years continuous current turbo dynamos were looked at askance by engineers on account of commutation troubles, for it is easy to see that the ordinary constants applicable to slow speed dynamos to secure sparkless commutation are far exceeded when the speed is raised to that of turbine-driven dynamos. On this account it was early seen that some sort of compensating winding to improve the commutation and compensate for the reaction of the armature was necessary. Commutating poles alone have not proved satisfactory in practice, there being nearly always considerable difficulty in securing good commutation witht them and as a con-

*Paper read before the British Association.

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sequence commutating poles combined with compensating winding—the commutating poles giving the reactance voltage necessary for commutation and the compensating winding, compensating for armature reaction—have been adopted by many firms. But even better commutation can be secured by a compensating winding alone, in which the ampere-turns of the compensating winding exceed the ampere-turns of the armature to such an extent as to give a commutating field in the gap between the pole-pieces.

Such compensating winding is generally chiefly concentrated on the pole-pieces, and is made with from 2 to 2½ times the number of ampere-turns of the armature, in order both to compensate for leakage and to give a good commutating field, and since this method of compensating has no iron commutating pole, it has the advantage that there is no self-induction to cause time lag at sudden changes of load, and, as the field of the gap between the poles is entirely in air it instantly responds to changes of current in the compensating winding, and thus the sparking found when there is a sudden change of load with commutating poles is avoided, and the risk of a flash-over largely reduced.

Also since there is no iron to become saturated, the commutating field is always strictly proportional to the load, and thus the trouble due to saturation causing sparking at some loads and not at others is avoided. This advantage is especially prominent where the dynamo is required to give varying voltages and to commutate at any of them without outside adjustment of the compensating windings by diverters or otherwise.

The adoption of these devices has made it possible to make turbo dynamos of large size, and now as much as 1,500 kw. is put into a single armature, whereas before such compensating devices were adopted 500 kw. was the maximum, and even then the commutation was anything but satisfactory.

STANDARD PATTERN.

In turbo alternators there is practically now—except for small sizes and low voltages—one standard pattern—that is, a revolving field rotating inside a stator. In the stator there is little variation in design, except in regard to the ventilating arrangements, which have to be very ample on account of the comparatively large quantity of heat to be removed from a small volume.

One point which has received great attention in recent years is the staying of the end windings of such alternators, it having been found that, owing to their great length, when a "short" took place the stresses on the winding were such as to break the insulation and cause disaster. The amount of these forces has been vastly more than was ever anticipated, and if the windings are not thoroughly stayed, such movements may be set up as to cause disaster. In the rotors there are two prominent types, the barrel and the salient pole, and much discussion has ensued as to the advantages of the one or the other. After considerable experience of both, on the whole I may say that at present I prefer the salient pole type. Ample ventilation is much easier to provide for, and improvements made in protecting and supporting the field coils of this type of rotor have resulted in a design giving great reliability with the maximum use of the space available. One improvement has been enclosing every coil in a tight sheath of sheet steel, so that any movement which may take place due to centrifugal force is between the steel sheath and the body of the rotor, and thus the insulation is protected from any rubbing which might cause it to be cut through and, consequently, break down.

Voltage regulation of alternators is also of considerable importance, as owing to the inductive load required by induction motors there is a heavy demagnetizing effect on the rotor, and consequent drop of voltage when the load rises. Several methods have been proposed for compounding alternators, most of them requiring a separate commutator or moving contacts altering the resistance of the exciter or main windings, but a method of compounding alternators has recently been brought out, which is being largely used with good results. In this apparatus the current supplied by the machine is made to act on the exciter field system in such a way as to reduce the leakage, artificially increased in the first instance, and so raise the voltage of the exciter, and increase the excitation of the alternator, so that any desired amount of compounding required can be obtained. This arrangement has been recently described in a paper before the Institution of Electrical Engineers.

TURBO BLOWERS.

The other applications of the steam turbine, such as driving air compressors and pumping water, have also been largely extended during the last few years, and especially prominent in this direction has been the application of turbo blowers to blast furnace work, some having been recently installed for as much as 50,000 cu. ft. of air per minute at 10 to 15 lb. pressure. In this connection it may be mentioned that a very usual size, which is for about 20,000 cu. ft., weighs about 25 tons, and that an ordinary reciprocating blower of equal capacity weighs about 450 tons or about 18 times as much as the turbo blower.

In many parts of the country reciprocating engines are running non-condensing, and it has now been found that the exhaust steam from them is of great value. Such exhaust steam cannot be practically utilized by reciprocating engines on account of the huge size and volume of the cylinders required, but it is quite otherwise with the steam turbine, where the large volumes of the low presure steam are exactly what are required for the highest economy. These considerations have led to the introduction of exhaust steam turbines, taking steam at atmospheric pressure and exhausting into a condenser.

When it is remembered that there is as much power in the steam from atmospheric pressure down to 27½ in. as there is from 150 lb. down to atmospheric pressure, it is easily seen that the power of a non-condensing plant can be doubled by the addition of an exhaust steam turbine and condenser, and in cases where there is not a supply of cooling water, improvements in cooling towers have enabled them to be put up both cheaply and well.

In this connection the use of intermittent supplies of exhaust steam, such as that obtained from engines running intermittently, as in rolling mills or winding engines at collieries, has received a great impetus by the utilization of thermal accumulators, in which the intermittent supply of steam is alternately condensed and re-evaporated, so that a constant flow is obtained for use in the exhaust steam turbine.

And yet another refinement has been introduced by the use of mixed pressure turbines, in which there is a low pressure part sufficiently large to give full power when working with exhaust steam, and if the supply of this fails, a high pressure part is brought automatically into action, using steam direct from the boilers, and thus there is economical running, whether the reciprocating engines supplying the exhaust steam are working or not.

THE QUESTION OF VACUUM.

In all turbines the question of vacuum is a very important one, and various improvements have been made in condensers to enable higher vacua

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to be obtained. The importance of this will be seen when it is remembered that in the average steam turbine 1 in. of vacuum is equivalent to from 4 to 5 per cent of steam consumption, or, in other words, it may be taken that for every 3° Fahr. by which the temperature due to the vacuum is reduced, a gain of steam consumption of 1 per cent is made.

In this connection increase of circulating water is very important. A very usual amount is about 30 times, but if this is increased to 45, the gain in consumption is 4 per cent, and if increased to 65 times a further gain of 2 per cent is made. As a rule, extra circulating water can be pumped without much difficulty, the extra power required for this being very small but generally the temperature of the inlet to the condenser is fixed by the supply of water available.

The great desirability, then, in a condenser is to obtain the temperature due to the vacuum as close as possible to that of the water leaving the condenser, as, of course, the maximum vacuum possible is that due to the temperature of this water. In ordinary condensers, it is generally found that this difference amounts to 20 to 25° Fahr., and among the various arrangements to reduce this may be mentioned dry air pumps, and also the arrangement of baffles and pumps in the "contraflo" condenser. But a method which has been very satisfactory in practice is what is called a "vacuum augmentor," which is simply a small jet of steam drawing the air and vapor from the condenser, and delivering it through a small auxiliary condenser to an ordinary air pump, so that while there may be, say, a vacuum of only 27½ in. at the air pump, 28½ in. or 29 in. may be attained in the main condenser. Such an appliance is especially valuable when, as is often the case on board ships at sea, the system has considerable air leaks. With this arrangement the difference between the temperature of the water leaving the condenser and that due to the vacuum can be reduced to about 5 or 6° Fahr., and this when condensing up to 12 lb. of steam per hour per square foot of condenser. As will be seen, this shows an economy in the turbine of some 6 per cent in steam consumption above an ordinary condenser, and when it is remembered that the steam jet of an augmentor uses only about 0.6 of 1 per cent, or only one-tenth of the steam consumption gained, it is easy to see that a great benefit is derived from the use of such an arrangement.

MARINE TURBINES.

In marine work, the development of the steam turbine also is very rapid. Two years ago the great express Cunarders Lusitania and Mauretania were only in process of construction, now they have proved themselves to be the fastest liners afloat, and it is pleasing to note that the turbines of these great ships have proved most satisfactory on service. It was a great step from the 8,000 H. P. of a cross-channel steamer, which was the largest that had been made at the time these boats were designed, to the 65,000 H. P. of these express Cunarders, and reflects great credit on the courage and foresight of the Cunard Co., and also on the various contractors, designers and engineers engaged, that they have made such a great step in advance without, as many peope prophesied, building another couple of Great Easterns. More mistakes have been made in going from a small to a large thing in engineering than in anything else, but the various pitfalls which awaited those responsible have been successfully avoided. It is also interesting to note that the turbines proved themselves to be very economical, a consumption of 12.77 lb. per shaft horsepower having been attained as an average of the whole voyage across the Atlantic with about 150 lb. pressure at the entrance of the turbine, and a vacuum of 28.3 in. barometer 30 in.

At present all cross-channel steamers in hand are being fitted with steam turbines; the whole of the ships in the admiralty program have also turbine engines, and everyone knows what a success the Dreadnought and the Indomitable are, they being respectively the fastest and most powerful battleship and cruiser afloat.

Hitherto, the link supplied between the steam consumption in a marine engine, and the horsepower developed, which is represented by the indicated horsepower, has been missing in a turbine, but the introduction of the torsion meter, which measures the horsepower passing through a shaft by the amount of torsion caused, has supplied this missing link most satisfactorily. The introduction of this has been chiefly due in this country to the enterprise of Messrs. William Denny & Bros., of Dumbarton, and on the continent to Mr. Frahm, of Messrs. Blom & Voss, of Hamburg, both of whom on slightly different lines have worked out torsion meters which have proved very satisfactory in practice. This has enabled the various losses between the power in the steam and the power required to propel the ship to be even better located than they are in the case of a reciprocating engine where the indicated horsepower does not take into account the friction of the engine.

MIXED PRESSURE TURBINES.

The steam turbine, up to the present, has been almost entirely used for ships of 17 and 18 knots and above, and, in fact, it may be generally said that about 15 knots is the lowest speed of vessel at which the turbine can satisfactorily compete with the reciprocating engine as regards economy. The difficulty of the problem lies in the fact that at low speeds the screws have to be made to revolve at small revolutions, and at the same time the horsepower required is moderate, and thus the turbines have to be very large and heavy, and, besides this, the blades are so short that the loss by leakage is excessive. These considerations have led to the combination of a reciprocating engine for the high pressure part of the range where the volume of steam is small, and where the reciprocating engine is working exactly under the conditions for the best economy, and a turbine for the low pressure part of the range where the volume of steam is large, and where, therefore, the turbine is working under the very best conditions, and such an arrangement gives advantages over either the turbine, or the reciprocating engine for moderate speeds, and, in fact, it is anticipated that an extra economy of about 15 per cent can be attained in this way. The advantages of such an arrangement were first pointed out by Mr. Parsons in 1894, but has only recently been put into practice. Many various arrangements and combinations are possible, but that which appears to be most generally favored is to have twin reciprocating engines each driving their own screws exhausting into a single turbine driving a center shaft. The reciprocating engines exhaust at about atmospheric pressure, and the turbine used the expansion from that pressure down to the vacuum of the condenser, which may be 28 in. or 28½ in. For maneuvering or going astern the reciprocating engines are used.

At present two large Atlantic liners are being built with the above arrangement for the Atlantic service, but it may be pointed out that the destroyer Velox, made in 1903 by the

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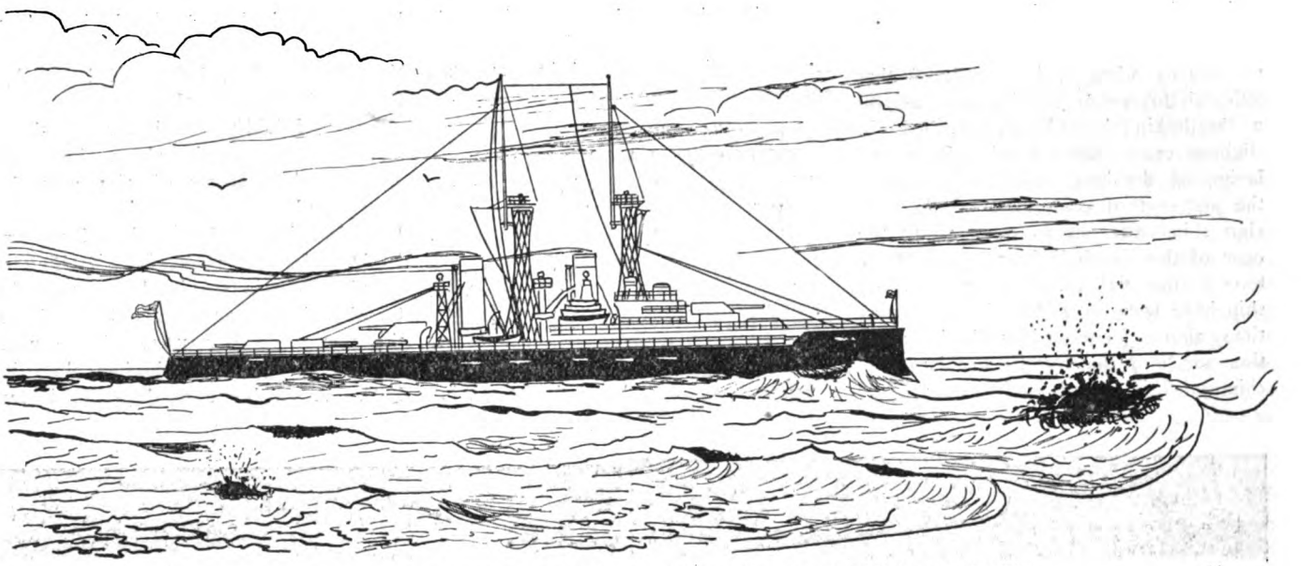


THE BATTLESHIP NORTH DAKOTA AS SHE WILL LOOK WHEN COMPLETED.

Parsons Marine Steam Turbine Co., Ltd., for the British admiralty, was the first ship fitted with such a combination.

It may be mentioned that eight years ago there were only 25,000 H. P. of marine turbines afloat; two years ago there were 800,000 H. P., and now there are over 1,750,000 completed and under construction.

BATTLESHIP NORTH DAKOTA LAUNCHED.

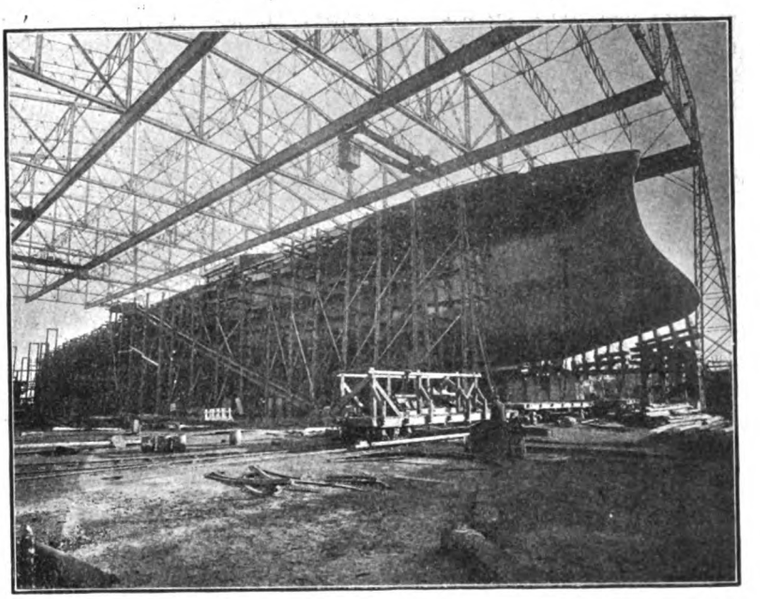
The line-of-battle ship North Dakota is the first of two vessels laid down last year for the United States Navy. The overall length of the ship is 519 ft. with an extreme breadth of 85 ft., and having a trial displacement of 20,000 tons. The vessel when ready for commission will have a main battery of ten 12-inch breech loading rifles mounted in turrets en barbette on the centerline of the vessel, thus permitting all of the guns to fire on either broadside and having two of the turrets on a higher level than those immediately in front of them, permitting these guns to be fired over lower turrets, an arrangement designed by the United States Navy and since copied in the latest German and Brazilian Dreadnoughts. She was launched at the Fore River yard on Tuesday last and christened by Miss Mary Benton, Fargo, N. D.

In general appearance the vessel is not dissimilar from existing battleships having the orthodox ram stem and straight stern, but the installation of the latest fire control systems will necessitate range finding positions on top of lattice work towers, which on completion will give the vessel rather a novel appearance. These towers were originally tested on the Monitor Florida by firing 6-inch shells into them to demonstrate their stability under attack.

In addition to the main battery previously noted the vessel will be equipped with a secondary battery of smaller guns for repelling attacks of torpedo boats and torpedo boat destroyers, and will likewise have a number of submerged or under water torpedo tubes to enable the ship to discharge these effective missiles at possible enemies.

The guaranteed speed of the North Dakota is much in excess of that obtained in existing battleships, a speed of 21 knots being required under very stringent trial conditions. This speed, it is expected, will be exceeded by the huge Curtis turbines installed in the engine room for driving twin shafts, the steam being generated by Babcock & Wilcox water tube boilers which are so constructed as to use oil for fuel in addition to coal. These turbines of the Curtis or American type first demonstrated their superiority over the Parsons or English type turbines by their remarkable performance on the U. S. Scout Cruiser Salem, a recent production of the Fore River Works.

The remarkable record made by the shipbuilders in launching the North



PHOTOS TAKEN ON NOV. 2 SHOWING THE NORTH DAKOTA 58.8 PER CENT COMPLETED.

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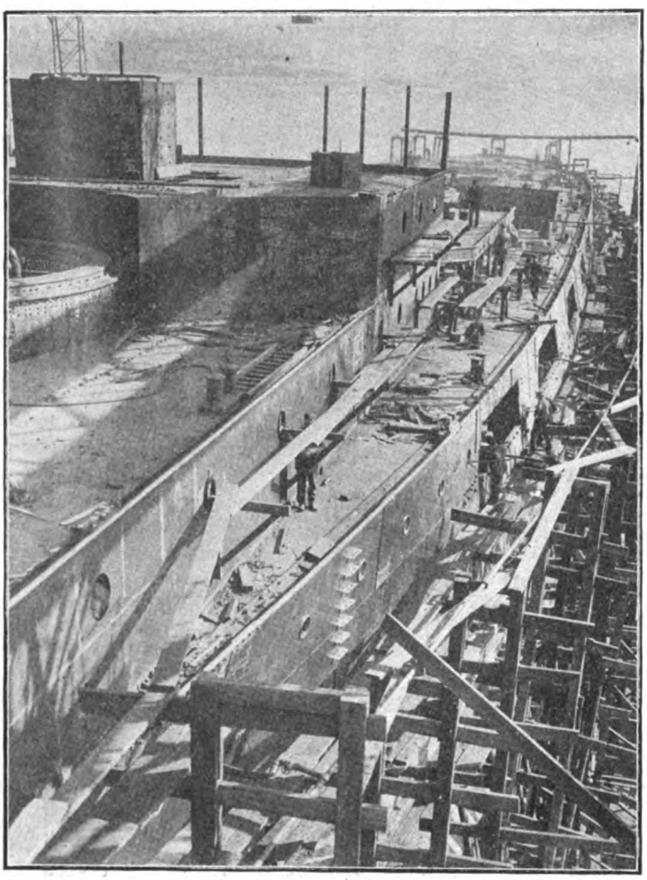
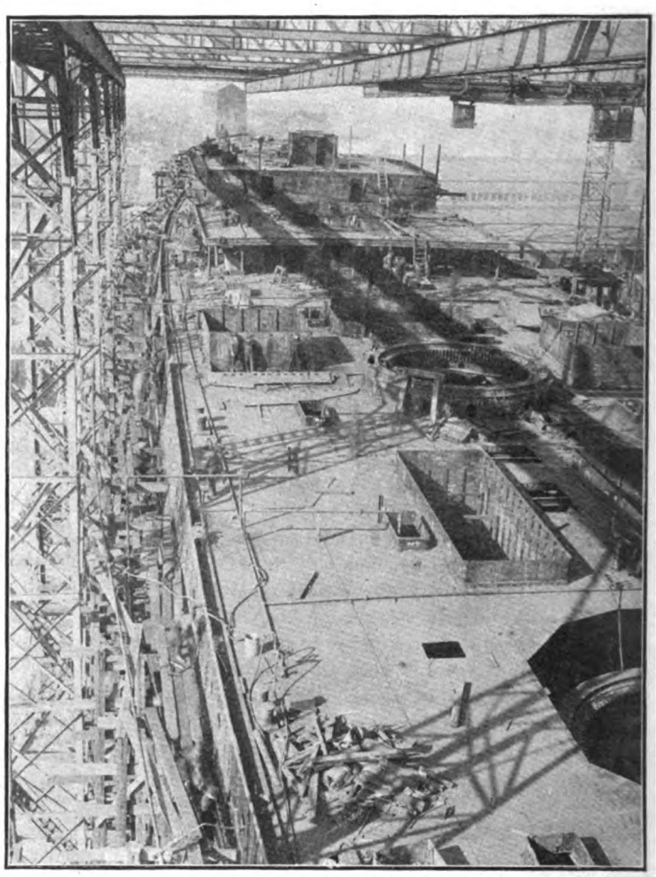
Dakota in 10¾ months from the laying of the keel on Dec. 16 last is noteworthy when it is considered that although in one or two instances abroad a battleship has been launched in slightly over eight months from the laying of the keel, still in these cases the per cent of completion of the foreign ships was not so great as in the case of the North Dakota, where 9,000 tons of material, or 60 per cent of the ship have been worked in in the record time above mentioned, and, in addition, much of the vessel's auxiliary machinery, fittings and equipment are already finished and ready for installation, including the five huge turrets in which will be installed the main battery of the vessel. These turrets are at present completed and lying on the dock alongside of the berth to be occupied by the North Dakota when she takes her initial dip, and the installation of these housings will be at once proceeded with. It is rightly considered therefore, that the Fore River Co. have made a world's record in the construction of the North Dakota to date, and should the same rate of production be maintained for the 40 per cent yet to produce before the vessel is ready for trial, it will result in all records for battleship building being at least equalled, if not surpassed.





PHOTOS TAKEN ON NOV. 2 SHOWING THE NORTH DAKOTA 58.8 PER CENT COMPLETED.

OCTOBER LAKE LEVELS.

The United States lake survey reports the stages of the great lakes for the month of October, as follows:

Lakes—	Feet above tide water New York.
Superior	602.69
Michigan-Huron	580.86
Erie	572.31
Ontario	246.44

Since last month, Lake Superior has fallen 1¼ in., Lakes Michigan and Huron have fallen 4¾ in., Lake Erie has fallen 5 in., and Lake Ontario 8½ in. The large fall in the levels of all the lakes has been due to the continuance of the drouth. During the past three months little rain has fallen.

During November, Lake Superior should fall 2 in., Lakes Michigan and Huron 6 in., Lake Erie 6 in., and Lake Ontario 7 in.

Lake Superior is 5½ in. lower than the average October stage of the past 10 years and about 5½ in. less than last year. It is 10¼ in. higher than in October, 1892, but 1¾ in. lower than in October, 1906, and lower by 8½ in. than in October, 1903.

Lakes Michigan and Huron show a stage about 1¾ in. above the average October stage of the past 10 years and 16½ in. higher than in 1895, but 3¾ in. lower than last year. In 1885 the water was 26¼ in. higher.

Lake Erie is 4½ in. lower than in October last year. It is 3 in. above the mean October stage of the past 10 years and 18 in. higher than in 1895. It is, however, 13¼ in. lower than in 1876 and 16¾ in. lower than in 1885.

Lake Ontario shows the highest October stage since 1905, when it was slightly higher. In 1861 it was 16½ in. higher. It is 11¼ in. higher than the average October stage of the past 10 years, 33¼ in. higher than in 1895, and 22¾ in. higher than in 1899, but is 7 in. lower than in 1885.

During 1907, 21,119,547 tons of coal were used in Great Britain for the smelting of iron in blast furnaces.

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LAKE FREIGHT SITUATION.

The lake freight situation presents little sign of change. Ore is moving quite freely but little outside tonnage is being employed. Shippers are practically ready to quit business as soon as ore becomes difficult to handle, as it will as soon as it begins to freeze in the pockets. The movement of ore so far this month has been quite heavy and if the present clip were kept up throughout the month about 4,000,000 tons would be moved. It is not expected, however, that much more than 1,000,000 tons will be moved during the last half of November. Barges are being laid up steadily and the Pittsburg Steamship Co. is already laying up some of its steamers. The season will be well over at the end of November. Only a few storage cargoes will be handled during December. The coal movement has continued light.

Following are the ore shipments by ports:

Port—	Oct., 1906.	Oct., 1907.	Oct., 1908.
Escanaba	697,068	779,626	739,924
Marquette	363,481	359,662	306,622
Ashland	413,029	381,507	498,802
Superior	904,571	1,176,027	644,175
Duluth	1,620,828	2,502,256	1,730,447
Two Harbors....	1,063,817	1,283,576	1,179,140
Total	5,062,794	6,482,654	5,099,110
Port—	To Nov. 1, 1906.	To Nov. 1, 1907.	To Nov. 1, 1908.
Escanaba	4,976,360	5,253,043	2,746,116
Marquette	2,509,286	2,701,812	1,177,730
Ashland	3,049,054	3,103,838	2,019,948
Superior	5,352,745	6,747,945	2,908,619
Duluth	9,955,216	11,908,539	7,931,568
Two Harbors...	7,405,174	7,326,684	4,946,091
Total	33,238,835	37,041,861	21,730,072

PIG IRON SITUATION.

Heavy buying of pig iron, with some advances in prices, more especially advances in basic and northern No. 2 foundry, has been the leading feature of the market during the week. Too, the general tone of the market is much better. In the south, $13 for No. 2 is the prevailing figure for the first quarter of next year, and furnaces are not contracting to any extent beyond that period. Indications of increased buying by the railroads, including everything from cars and rails to track fastenings, are very noticeable. The old prices for steel rails—$28 for Bessemer and $30 for open-hearth—will prevail during next year. It is expected that orders of good size for rails will be placed soon, several of the larger lines having purchased within the past week lots of 12,000 to 25,000 tons. Contracts for structural material, while not numerous, include some very fair tonnages, especially around New York City. There is more activity in the coke market, confined principally to furnace coke. Prices are firm, with a manifest tendency toward advance.

SHIP BUILDING ON THE LAKES.

It is a little early to speak with authority on the subject of new construction on the lakes, but there is reason to believe that the ship yards will be reasonably employed on new work during the winter. Contracts for 10 vessels have so far been entered into and additional contracts are pending. Among the latest orders is one booked by J. C. Wallace, president of the American Ship Building Co., for a bulk freighter to be 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep. She will have triple-expansion engines with cylinders 23½, 38 and 63 in. diameter by 42-in. stroke. Steam will be supplied from two Scotch boilers, 14½ ft. diameter and 11½ ft. long, allowed 180 lb. pressure. Whom this steamer is to be built for has not as yet been announced. This makes three bulk freighters that the American Ship Building Co. have under order for next year's delivery. The Great Lakes Engineering Works has just closed a contract with the Mutual Transit Co., of Buffalo, for two package freighters to be 350 ft. over all. 340 ft. keel, and 46 ft beam. In addition it is building two bulk freighters for Boland & Cornelius, of Buffalo, and the Toledo Ship Building Co. is building one for R. P. Ranney, of Cleveland. Two passenger steamers are also under way, one at Toledo and one at Manitowoc.

The yards will also be busy on repair work as a great many repairs that were naturally delayed during 1908, owing to dullness in trade, will now be made. The outfitting of vessels for 1909 will be very heavy.

KEEPING SHIPPING OFFICES OPEN.

The shipping offices of the Lake Carriers' Association will not be closed at the closing of navigation as in former years. The offices in Detroit, Buffalo, Cleveland, Chicago, Milwaukee and Duluth will be kept open and will be maintained by the association practically as club rooms for sailors, being furnished with books, writing materials and indoor games such as cards, checkers, dominoes and chess, without charge. The object is to provide attractive quarters for the sailors and to keep them away from the saloons as much as possible. Moreover it will tend to cement the various elements that go to make up the great business of the lakes.

NEW AIDS FOR UP AND DOWN CHANNELS IN ST. CLAIR RIVER AT ST. CLAIR.

With a view to making available two separate channels in the St. Clair River opposite St. Clair, Mich., on east and west sides of the Middleground shoals, the former to be used by up-bound traffic and the latter by down-bound traffic, the following changes in the Middleground buoyage have been approved by the U. S. Lighthouse Board and will be established November 6:

St. Clair Middleground lower end red gas buoy (light fixed white 10 seconds, eclipsed 10 seconds), at present marking the south point of the main Middleground nearly abreast of the mouth of Pine River, will be moved 2,900 feet southward to mark an 18-foot spot nearly opposite the Oakland Hotel, in which position it will indicate the south point of division of the two channels. Up-bound vessels should note that this red buoy is left to port in passing.

A red spar buoy will be placed in the position now occupied by the above gas buoy.

The red and black striped buoy now marking a shoal about 500 ft. northerly of the new location selected for the gas buoy will be discontinued.

St. Clair Middle Shoal buoy No. 3, a black spar near the east side of the shoals in the Canadian (up-bound) channel opposite the Michigan Central Railroad dock at Courtright, Ontario, will be moved about 250 ft. southeastward to mark the extreme easterly edge of the shoal at that point.

The Canadian Government will provide an acetylene-gas buoy for the most northerly and easterly 18-ft. spot of the detached shoals in the Canadian channel east of the Middleground. This spot is at present marked by a black spar buoy.

The northerly dividing point of the two channels is already indicated by Middleground upper end striped gas buoy, opposite the Mooretown Salt Co.'s dock.

Both channels are wide and deep and can be easily followed when the new marks are in place.

The steamer Wexford, down-bound with grain, struck the south pier in making the entrance to the Canadian canal near the same place where the Lyman C. Smith struck some time ago. She has a hole on her starboard side about a foot wide and 6 ft. long.

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November 12, 1908.

AID TO AMERICAN SHIPPING.

The San Francisco *Bulletin,* in its issue of Sept. 23, said:

"Those anxious parties who urge ship subsidies as a means of building up the merchant marine and thereby creating a seafaring class from which the crews of our navy may be recruited, have caught the stick at the wrong end. Ship subsidies would probably increase at the taxpayers' expense the number of bottoms flying the American flag, but they would not increase by one man the number of American seamen. The subsidized merchant marine would be manned by aliens. But it would do the nation no good to maintain by subsidies a large merchant marine—as if it were a vast fleet of private yachts—unless American merchant ships were to train a hardy race of American seamen. It is immaterial to the producer of goods for export and to the consumer of imported goods whether they are carried under the American or some other flag if all the profits of the vessel are to go to foreigners and if the vessel, whether American or not, does not give employment to Americans. * * * *

"The problem is easier to state than to solve, but certainly ship subsidies will not solve it. Meanwhile the ships of the American navy are manned with cowboys from the Mississippi valley. A sailor seldom enlists in the navy, for there are no American sailors."

To show the glaring inaccuracy of the *Bulletin's* statement, it is only necessary to quote the provision of the Ocean Mail Act of 1891 which is responsible for such oversea merchant marine as we have. That act provides as follows:

"The vessels employed in the mail service under the provisions of this act shall be American-built ships, owned and officered by American citizens, in conformity with existing laws, or so owned and officered and registered according to law, and upon each departure from the United States the following proportion of the crew shall be citizens of the United States, to wit: During the first two years of such contract for carrying the mails, one-fourth thereof; during the next three succeeding years, one-third thereof; and during the remaining time of the continuance of such contract at least one-half thereof; and shall be constructed after the latest and most approved types, with all the modern improvements and appliances for ocean steamers."

Apparently the *Bulletin* has never read the provisions of this act. The *Bulletin* is not the only sinner. There are lots of persons writing and talking about the merchant marine that don't know a thing at all about it. The most effective means of building up the American merchant marine and providing sailors for our navy is to extend the provisions of the Ocean Mail Act to reach quarters not now visited by our ships and to provide a retainer for the building up of a naval reserve.

NONE BUT AMERICAN SHIPS.

It is a pleasant thing to note that the high authorities of the navy department have promptly recognized the wrong to the merchant marine involved in the recent use of foreign ships to convey navy coal to Guantanamo, Cuba, and that they have engaged American ships and announced that hereafter the department will insist upon the exclusive use of American vessels for this service. This is exactly what the MARINE REVIEW would expect of a department presided over by Acting Secretary Newberry.

Doubtless the use of foreign shipping in the first place was the mistaken act of subordinates who paid small heed to public policy and were not familiar with the true significance of law. But the use of foreign ships under any circumstances for a short coastwise voyage like that to Guantanamo, when scores of American vessels were available, was a wrong to the American merchant marine which demanded this prompt correction by the navy department.

The large seagoing schooners of the Atlantic coast, of which there are several hundred in constant use, are thoroughly fit for the delivery of coal at Guantanamo, and indeed are frequently employed for the shipment of commercial coal to the West Indies as well as to the American ports on the Gulf of Mexico. These schooners, heavily built and strongly rigged for the rough work of winter voyaging, are efficient and economical carriers. One of them has recently been chartered to carry coal at $1.05 a ton to Galveston, as compared with the rate of $1.30 a ton which the navy department is paying to a foreign steamer for the shorter voyage to Guantanamo.

Moreover, when the navy department, aroused by protests, began to make inquiry for American ships it found an American steamer ready to accept a rate of $4.05 a ton, coal and transportation both included, for delivery at Guantanamo, as compared with $4.25 that had been paid for a foreign steamer. Therefore, it is not

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possible for the erring subordinates of the navy department to plead the excuse that they were seeking to save money for the government. For, as a matter of fact, they have chartered foreign vessels at a higher rate than they have found it necessary to pay American vessels, and these subordinates are, therefore, absolutely without defense before their superiors and before the nation.

The whole episode is one deserving of the severest inquiry by the naval affairs committees of congress. The law of the United States requires that none but American vessels shall be used for the transportation of naval and military supplies, unless the prices asked are excessive and unreasonable. This law has been construed fairly by the president and those in authority as meaning that a substantially higher price could be paid to American than to foreign vessels for this service, and there can be no question that this was the frank intent of the national lawmakers to give a real preference to American ships. But certain subordinates of the navy department have so flouted the law that they have actually paid a higher price to foreign than to American vessels. The men who are responsible for this act, whoever they may be, ought to be driven out of the public service. We trust that this will be the result of the investigation which will be demanded of congress by American ship owners.

DR. SCHLICK'S GYROSCOPIC APPARATUS IN THE LOCHIEL.

Dr. Schlick's gyroscopic apparatus for preventing ships from rolling at sea has just given fresh proof of its power, and suitability for the work for which it is designed.

The first apparatus made in England has been constructed at the Neptune Works of Swan, Hunter & Wigham Richardson, Ltd., Newcastle, and has been fitted in the R. M. S. Lochiel, owned by the enterprising firm of Messrs. David MacBrayne, Ltd., of Glasgow.

During the last few days the apparatus has been very thoroughly tried on the Lochiel's ordinary route between Oban, Tiree and Bunessan, with most satisfactory results. The apparatus can be thrown in and out of action at will, and, when out of action, the vessel rolled to angles of 16° on each side; that is, the total angle of roll was no less than 32°; while when the apparatus was put into action the rolling was prevented and decreased to a total angle of roll of from 2° to 4°, an amount which is barely perceptible to a passenger.

The apparatus has previously been tried in England by Swan, Hunter & Wigham Richardson, Ltd., on an experimental vessel 116 ft. long, and these later trials on the Lochiel amply confirm the high expectations which have been raised.

The gyroscope on the Lochiel is driven electrically, requiring little attention, while the design has been simplified and the machine is now very compact, and requires but little space in the steamer.

Messrs. MacBrayne are well known for their magnificent passenger steamers which run on the Clyde, and among the western highlands and islands of Scotland. They study the comfort of their passengers in every possible way, and nothing which they have yet done will be more appreciated, especially in stormy seas, than the application of this apparatus.

As soon as the advantages of this apparatus are known to the traveling public, it will be a necessity on all boats carrying passengers, especially for short voyages, as by its means seasickness is greatly reduced, and "sea legs" almost becomes a meaningless phrase.

ETRURIA'S REMARKABLE MACHINERY.

The Etruria was the last of the really large ships to be fitted with a single propeller, and her engine is one of the heaviest and largest single engines ever built, the individual parts being of great size and weight. Thus, the crank shaft, which is 25 in. in diameter, weighs 27 tons; the connecting rod, 13¾ in. in diameter at its center, weighs just under 11 tons; and the piston rods, which are 11¾ in. in diameter, weigh about four tons apiece. A single propeller blade weighs six tons, and the whole propeller complete 37 tons. The engine is compound, with one 71-in. and two 105-in. cylinders, the stroke being 6 ft. With the exception of the crank shaft and the tail shaft, this engine is in all its parts identically the same as when it left the builder's hands in 1885, not even the brasses having been renewed. And even more remarkable evidence of good workmanship and careful attention is shown in the boiler room, which contains the same Scotch boilers that were put in nearly a quarter of a century ago. These boilers have the same tube plates, 15 per cent of the original tubes, and, most remarkable of all, the same corrugated furnaces as when they left the builder's hands. Today this ship is capable of steaming 18.5 knots under favorable conditions of weather.—*Engineer*, London.

BRITISH BATTLESHIP COLLINGWOOD LAUNCHED.

The Collingwood, the most powerful of all British battleships and the sixth vessel of the Dreadnought class, was launched at Deverport last week. While this new battleship is of the same type as the Dreadnought and has the same number of heavy guns and the same speed, there are some variations of detail which make this vessel more formidable. Her big guns have a greater caliber, and the guns for defense against torpedoes have higher muzzle energy and velocity. The Collingwood was laid down in February, and as more work has been done on her than is usual before launching, the admiralty expects to place her in commission early in 1910. The hull of this ship is the heaviest dead weight that ever left the launching slip. It is estimated that it displaced 8,300 tons of water. When completed the displacement of the Collingwood will be over 19,250 tons.

The Northwestern Expanded Metal Co., 930-950 Old Colony building, Chicago, has recently issued an instructive little bulletin on its Kno-Burn metal plastering lath. This company put out the original small mesh metal lath and the booklet gives much valuable information to the user of that product, including many formulae for suitable plasters, stucco, etc., tables showing areas covered by mortar and the number of staples required per 100 sq. yds. for various kinds of work. This is the first of a series of pocket size booklets all of which will be sent free of charge upon request as issued. Those to follow will treat of Expanded Metal Information, Sidewalks, Beams and Columns, Floor and Roof Slabs, Slab Bridges, Arch Bridges, Sewers and Culverts, Tanks and Walls.

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COMMERCE OF LAKE SUPERIOR.

October was one of the finest sailing months of the year and would have been perfectly ideal had it not been for smoke. Sailing conditions are reflected in the movement of freight, that for October being the heaviest of any month this year. The movement of freight through the St. Marys canals for October was 7,351,082 tons, being somewhat in excess of the August movement, which was 7,181,430 tons. The total movement of freight to Nov. 1 is 34,076,344, a decrease of 16,399,347 tons for the corresponding period last year. Following is the summary of freight movement to Nov. 1 with corresponding data for the two preceding years:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

Items.	To Nov. 1, 1908.	To Nov. 1, 1907.	To Nov. 1, 1906.
Coal, anthracite, net tons	1,124,019	1,219,844	823,800
Coal, bituminous, net tons	7,310,721	8,626,500	6,495,056
Iron ore, net tons	20,953,638	35,036,615	31,307,915
Wheat, bu.	66,018,755	70,115,202	55,556,229
Flour, bbl.	4,091,349	5,190,979	4,998,874

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO NOV. 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

Items.	To Nov. 1, 1908.	To Nov. 1, 1907.	To Nov. 1, 1906.
Copper, net tons	75,708	63,767	88,651
Grain, other than wheat, bu.	24,825,027	31,643,299	39,606,805
Building stone, net tons	1,019	898	6,222
Flour, bbl.	4,090,459	5,190,738	4,989,610
Iron ore, net tons	20,953,638	35,036,614	31,307,915
Iron, pig, net tons	15,696	12,959	19,054
Lumber, M. ft. B. M.	384,502	579,681	782,695
Wheat, bu.	66,018,755	70,115,202	55,556,229
Unclassified freight, net tons	84,227	94,245	136,639
Passengers, number	25,578	30,742	30,936

WEST BOUND.

Coal, anthracite, net tons	1,124,014	1,219,844	823,800
Coal, bituminous, net tons	7,310,721	8,626,500	6,495,056
Flour, bbl.	890	250	9,264
Grain, bu.	5,400	2,152	6,749
Manufactured iron, net tons	219,911	246,322	289,087
Salt, bbl.	467,777	417,960	404,688
Unclassified freight, net tons	617,130	768,616	817,042
Passengers, number	25,841	30,647	30,749

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

Items.	To Nov. 1, 1908.	To Nov. 1, 1907.	To Nov. 1, 1906.
East bound freight of all kinds, net tons	24,734,614	39,552,112	35,917,954
West bound freight of all kinds, net tons	9,341,730	10,923,579	8,487,561
Total freight, net tons	34,076,344	50,475,691	44,405,515

Total number of vessel passages to Nov. 1, 1908, was 12,909, and the net registered tonnage, 25,782,120.

IMPROVEMENTS ON NIAGARA RIVER.

The second year's work on the great $4,500,000 government improvements in the Niagara river is nearing a close, with a substantial part of the enormous task done, while the indications are coming clearer every month that the government's appropriation for this work will result in the greatest possible benefit to the Niagara frontier and the marine interests of that district as well as around the great lakes. The industrial awakening thereabouts, manufacturing sites already purchased along the Niagara river and the fact that most of the raw material which will be needed will be hauled by boats from the head of the lakes, makes the improvement one of the most notable in this country at the present time.

It was at the opening of the season of 1907 that the first of the rock excavation was begun and this was at the head of the river, which is to be the beginning of the great 23-ft. ship channel, a waterway to be created in Niagara river, extending 12 miles northward to the Tonawanda and crowding the American shore. There have been three principal contracts given in this work up to this time. Two of these were for excavation of rock between the head of Niagara river and Black Rock, the other for the building of cofferdam and foundations of what is to be known as the Black Rock ship lock. Of the excavating, something like 30 per cent is now finished. The Buffalo Dredging Co. and the Empire Engineering Corporation of New York have these contracts. The excavating between the foot of Lake Erie and Maryland street is complete. On the portions north of this point dredges are now at work removing great quantities of rock every day. The ship lock is well under way. A cofferdam has been built of sheet steel piling and the excavation therein has now reached a depth of 30 ft., leaving only 10 ft. to be removed.

As the appropriations of congress are made the work will progress and the congressmen of this district are being pretty generally urged to recommend the pushing of this work as fast as possible. Of the total estimated cost of $4,500,000 up to date $2,700,000 has been appropriated for excavation and ship lock. The contracts with the government demand a completion of the excavations called for in the first two contracts before Dec. 31, 1910, the Empire Engineering Corporation having 6,300 ft. of the work, and the Buffalo Dredging Co., 4,000. The ship lock, which is being constructed by McArthur Bros. Co., of New York, is required to be complete work before June 30, 1912. This contract, however, does not call for the complete lock, but only the walls and excavation. The contract for furnishing the gates and mechanical equipment, etc., has not been made. The lock is to be 650 ft. long and 70 ft. wide, enabling the largest lake boat to lift through easily. This will be a boon to the iron and steel industry in particular, as the ore which will pass through the channel is best handled by the largest boats. If congress will pass out the money for the continuation of this great work it is easily possible to finish the project by the close of 1912, leaving open one of the greatest industrial possibilities in the country.

Across from Buffalo the river is 1,600 to 2,000 ft. wide with an average depth through the deep water basin of 25 to 40 ft. The rock and shallow water lies along the American side, but when the ship canal is perfected, the door to the Niagara frontier development will be thrown wide open, the maritime interests of the great lakes will be supplemented and a great feat of engineering accomplished.

The Saginaw board of trade is urging the United States government to require the widening of draw bridges over the river in the lower portions of the city in order to enable the largest vessels to use it.

John Brennan & Co., of Detroit, will supply the boilers for the new passenger steamer building for the White Star Line.

John Bishop has launched the knockabout fishing schooner Ethel B. Penny at his Gloucester ship yard. She is building for Boise & Watson, of Boston, Mass.

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SHIP YARD NOTES.

The Isthmian canal commission is about to advertise for four knock-down steel dump barges of a capacity of 400 cu. yds., to be delivered complete at Colon or La Boca on the Isthmus or at an Atlantic or Gulf port.

The West End Dry Dock Co., of Brooklyn, N. Y., has recently filed a schedule in bankruptcy which shows the company's liabilities to be $10,638 and nominal assets $15,195, consisting of dry dock, $2,000; materials, $1,000; tools, $100, and accounts, $12,095.

The Gilchrist ship yard at Belfast, Me., has recently lengthened the tug Stella, owned at Rockland, Me., adding 5 ft. amidships and raising her sides 1 ft. She has now been renamed the E. D. Haley.

The Fore River Ship Building Co., Quincy, Mass., launched the sea coast artillery steamers Gen. Robert Anderson and Gen. Richard Arnold recently. They were built for the quartermaster general's department of the United States army and are each 98 ft. long, 22 ft. beam and 12 ft. deep.

The Maryland Steel Co., Sparrow's Point, Md., has resumed operations in its large steel plant which has been closed for a short time. There are now 800 workmen on the pay roll. In the marine department work on the plates for the three naval colliers is being pushed. The keels of the vessels have been laid and considerable other work done and they are certain to be finished well within the contract time.

The Kelley-Spear Co., of Bath, Me., has a contract for building a new tugboat for the Commercial Towboat Co., of Boston, Mass. The tug will be used in the coastwise trade and is to be 138.9 ft. long, 26.6 ft. beam and 15.11 ft. deep. The engine will be built at the Bath Iron Works, at Bath, and is to be one of the triple-expansion type, with Scotch boiler, and will develop 700 H. P.

McIntyre & Henderson, Baltimore, Md., are engaged in the completion of a new wooden harbor tugboat, the hull of which was built at Solomon's, Md. The boiler and engine have already been installed and the cabin and pilot house are nearly completed. The vessel is to be named Emmet after a son of Mr. McIntyre. The Emmet is 67 ft. long, 16½ ft. beam and 7½ ft. deep.

H. Anderson, the San Francisco ship builder, whose yard is at Hunter's Point, has recently launched the gasoline schooner Hiram Bingham, built for the Episcopalian Missionary Society, of Boston. The Bingham is 63 ft. long, 15 ft. beam and 7 ft. deep and is equipped with a 50-H. P. Atlas gas engine. She sailed at once for the Gilbert Islands.

Joseph Supple, the Portland, Ore., ship builder, has been given a contract by the Kitsap Transportation Co., of Seattle, Wash., for the construction of a new passenger steamer for Puget Sound service. The vessel is to be completed by May 1, 1909, is to cost $75,000 and must be capable of making 18 miles per hour on trial. Her dimensions will be as follows: Length, 140 ft., beam, 22 ft., and depth of hold, 8 ft. The steamer is to be capable of accommodating 300 passengers.

The Price ship yard at Bandon, Ore., has recently completed the tug Gleaner. She was built to the order of the Gardner Mill Co., of San Francisco, and is 100 ft. long, 22 ft. beam and 10 ft. deep. The Gleaner has been fitted with an automatic towing machine and two powerful fire pumps and her cost complete was $45,000. The tug Klyhian has also been completed for C. F. Dow, of San Francisco, Cal.

The Willamette Iron & Steel Works, Portland, Ore., launched the new steel Puget Sound passenger steamer H. B. Kennedy Nov. 7. She is 190 ft. long, 28 ft. beam and 12 ft. deep and is equipped with one engine with cylinders 18, 27, 34 and 34 in. diameter by 24 in. stroke. The boilers, two in number, are of the Ballin water tube type. The Kennedy has been built at a cost of $150,000 for H. N. Kennedy and Joshua Green, of Seattle, Wash.

The Chesapeake Gas Engine Co., a new incorporation, is soon to operate a ship yard and engine works on Sunset Creek, Newport News, Va. F. J. Robinson has been made manager and the new company is to engage in the manufacture of gasoline engines, of one and two cylinders and ranging from 4 to 20 H. P. and reversing gears up to 100 H. P. The company is also to be equipped for making all kinds of marine repairs.

The Puget Sound Ship Building Co., of Portland, Ore., has nearly completed the extensive repairs it is making to the big tramp steamship Beechley, which went ashore near St. Michael, Alaska, last spring. This company was the successful bidder and secured the contract at $24,500. It now appears that the repairs have actually amounted to a much greater sum, estimated to be between $34,000 and $35,000 and there promises to be some delay in settling the matter of payment.

John Twigg & Sons, San Francisco, Cal., has been awarded a contract to build a launch for the use of the United States immigration service on San Francisco Bay. The launch is to cost $9,500 and will be ready for service the first of the year. She is to be 58 ft. long over all, 10 ft. 6 in. beam and 4 ft. draught, and will be fitted with a 65 H. P. Union gas engine. She is expected to attain a speed of 11 miles per hour.

The Moore & Scott Iron Works, San Francisco, Cal., have been awarded contract for joiner work on the United States army transport steamer Sherman.

The Main Street Iron Works, San Francisco, Cal., is installing the machinery in the new steam schooner Majestic, owned by Ira J. Harmon, of San Francisco. Her houses are being finished by John W. Dickie & Son, of the same city.

The Nickerson-McFarlane Machinery Co., Tacoma, Wash., recently performed large repair jobs on the steamships Bellerophon and Kumeric, both of which had sustained collision damages. On the former several plates were removed and some bent frames replaced.

The Heffernan Engine Works, Seattle, Wash., are to make permanent repairs to the Alaska steamer Seward which went ashore Sept. 20 at Cape Hincherbrock, Alaska. The bid on which this contract was awarded was $10,644 and the work is to be completed in one week's time.

W. H. McWhinney, who is interested in the Matthews ship yard at Hoquiam, Wash., is about to start a small ship yard at Aberdeen, Wash., for the purpose of effecting marine repairs exclusively. He will retain his interests at Hoquiam.

William Cryer, a boat builder at East Oakland, Cal., has laid the keel for a new passenger boat, which he is to build for Laurenzen Bros. for service on the Sacramento river. The hull will be of the torpedo type, 85 ft. long by 15 ft. beam, and she will be equipped with a 125 H. P. Atlas four cylinder engine. The boat is expected to have a speed of 10 miles per hour.

J. H. Price, Bandon, Ore., has almost completed the hull of a wooden bar tug which he is building for the Gardner Mill Co. The hull is 100 ft. long, 25 ft. beam and 10 ft. 9 in. deep and is constructed with sawed frames. Upon completion the hull will be towed to San Francisco where the engine will be installed by the Main Street Iron Works. It is of the compound condensing type with cylinders of 14 and 30 in. diameter and 20 in. stroke while the boiler is 11 ft. in diameter by 10 ft. 6 in. long. Wood is to be used for fuel.

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PACIFIC COAST NOTES.

Office of the MARINE REVIEW,
302 Pioneer Bldg., Seattle, Wash., Nov. 6.

Joseph Supple, boat builder, Portland, Ore., has secured a contract for a new steamer to be built by the Kitsap County Navigation Co. of Seattle for use on Puget Sound. The new steamer will be named Hyak, a Chinook Indian word, meaning "go fast," and will be one of the finest and fastest small passenger craft on Puget Sound. She will cost $75,000 and is to be ready for service May 1, 1909. In general she will follow the lines of the steamer Kitsap, built by Joseph Supple for the same company in 1906. The new steamer will be radically different, however, from the Kitsap in the shape of her stern, which will be more flat and will follow torpedo boat lines in general. The Hyak will be 145 ft. long, 23 ft. beam, with a passenger capacity of 400. She will be built of wood and will burn crude oil. Her machinery will be almost a duplicate of that in the Kitsap and will be furnished by Charles L. Seabury & Co., of Morris Heights, N. Y. A speed of over 20 miles an hour is expected.

The United States coast and geodetic survey steamer Patterson and the two-masted sealing schooner Pescawha collided in the Straits of Juan de Fuca in a dense fog at 2.30 A. M., Oct. 29. The schooner was considerably damaged above her deck but the Patterson escaped with only a few scratches.

Permanent repairs will be made on the Alaska Steamship Co.'s steamer Seward by the Heffernan Engine Works at its dry dock at Quartermaster Harbor. The Heffernan Engine Works was awarded the contract for $10,644, the Moran Co. having bid $11,780. While anchored near Cape Hinchinbrook, Alaska, last September, the Seward dragged her anchors and bumped on the beach. The contract calls for the repair or renewal of the plates which were damaged.

Congressman W. E. Humphrey stated recently: "I have the word of high naval officials that four of the eight submarines authorized at the last congress will be built on the Pacific coast and that these four will be stationed on the waters of Puget Sound. I have also received a letter from the secretary of the navy, stating that the bond for the construction of the new dry dock at the navy yard, Puget Sound, has been received. I fully expect that the next 30 days will see the beginning of the construction here of not only the largest dry dock in the United States but in the world."

Heffernan Engine Works, Seattle, has also secured the contract for converting the Boston Steamship Co.'s steamer Hyades from a coal to an oil burner. The contract price is about $4,800. The work will be completed in about two weeks and the Hyades will have her trial trip with oil burners Nov. 24. The Hyades is under charter to the Matson Navigation Co. and is operated between Seattle, Honolulu and San Francisco.

Sunday night, Nov. 1, witnessed another severe gale on Puget Sound. The wind came up very suddenly and at 10:08 P. M. attained a velocity of 50 miles an hour which, is the highest recorded velocity since Dec. 13, 1907. Considerable damage to small craft was the result but there were no serious mishaps. The launch Clark broke loose and was considerably damaged, as was the little government steamer Lieut. Elliott at Fort Ward, Wash.

The steamer M. F. Plant, which was damaged by heavy seas while crossing the bar at Coos bay recently, has been towed into San Francisco for repairs. Her stern post and rudder is damaged.

Owing to lack of ability to compete with foreign subsidized ships under present Pacific coast shipping conditions, the following fleet of American steamers is lying idle at San Francisco:

City of Peking, 3,669 tons, Pacific Mail line, laid up since Jan. 12, 1907; formerly in trans-Pacific trade.

Aztec, 2,298 tons, Pacific Mail line, laid up since early 1908; formerly in trans-Pacific and Central American trade.

Costa Rica, 1,167 tons, Pacific Mail line, laid up since April, 1908; formerly in Panama trade.

City of Panama, 1,046 tons, Pacific Mail line, laid up since early 1908; formerly in Panama trade.

San Mateo, 1,926 tons, Pacific Improvement Co., laid up since early 1908; formerly in California coast trade.

Ventura, 3,936 tons, Oceanic Steamship Co., laid up since Aug. 16, 1907; formerly in Australian trade.

Sonoma, 3,936 tons, Oceanic Steamship Co., laid up since Aug. 31, 1907; formerly in Australian trade.

Sierra, 3,796 tons, Oceanic Steamship Co., laid up since Oct. 4, 1907; formerly in Australian trade.

R. P. Schwerin, vice president and general manager of the Pacific Mail Steamship Co., stated that the company would try to keep running its remaining fleet, but that if no freight can be obtained these seven vessels may soon be at anchor, disengaged and dismantled.

The Pacific Coast Steamship Co.'s fast steamer President has been withdrawn from the Seattle-San Francisco run and laid up at the California port. The City of Puebla will take her place. The City of Puebla is considerably smaller than the President but is well fitted for the lighter travel during the winter months.

DECLINE OF TRANS-ATLANTIC TRADE.

The trade of the trans-Atlantic steamer lines for the first 10 months of 1908 when fully compiled has shown that at the close of the year 1908 the figures for the entire year will prove it to have been a very lean one as regards both freight and passenger traffic. The latter was of necessity the more reduced owing to the industrial depression which greatly affected immigration—a very large source of revenue.

It has been estimated that the various steamship lines will have a deficit at the end of the year to be divided among them of at least $25,000,000 as compared with the revenues for 1907, which, however, was an extraordinarily prosperous period. Nearly $20,000,000 of this amount can readily be accounted for in the regular passenger business, the chief item being of course the reverse in the steerage traffic.

The steamship lines, it is true, gained 232,711 passengers on their eastbound trips, due to labor leaving the country; but the stoppage of labor coming this way was so great that the inwardbound records show 856,329 fewer passengers than during the same period of last year. The detailed figures for the 10 months follow:

	1908.	1907.	Decrease.
FIRST CABIN.			
Westbound	83,568	92,152	8,583
Eastbound	85,122	90,762	5,640
Total	168,690	182,914	14,223
SECOND CABIN.			
Westbound	142,890	196,434	53,544
Eastbound	94,819	92,467	*2,352
Total	237,709	288,901	51,192
STEERAGE.			
Westbound	330,455	1,186,784	856,329
Eastbound	582,106	349,395	*232,711
Total	912,561	1,536,179	623,618

*Increase.

On the basis of $100, which, it is

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believed, is a very low average rate for first cabin; $45, which is equally low for the average second cabin, and $25 for steerage, the steamship lines for the first 10 months of 1908 are confronted by a deficit of $19,316,390 from the 1907 figures, as follows:

First cabin—14,223 passengers at $100	$ 1,422,300
Second cabin—51,192 passengers at $45	2,303,640
Steerage—623,618 passengers at $25.	15,590,450
Total deficit	$19,316,390

These figures cover Canadian as well as United States Atlantic port business. The figures by months show that the greatest outward movement took place in April, which is usually one of the most active months for inward travel.

GOVERNMENT AID TO SHIPPING.

EDITOR MARINE REVIEW:—On this side of the ocean such a thing as an American cargo steamer or sailing vessel is unknown, while British, French, German, Danish and the flags of every other nation are seen on all kinds of vessels.

One cannot help but admire the patriotism of the British nation, for here every individual is willing to be taxed so that the government can pay subsidies to British steamship lines.

The wisdom of paying subsidies to British steamship lines is shown from the fact that taxpayers of England profit greatly by reason of the trade of other countries which is encouraged by rapid communication. South America, India, Japan, China, Australia and every country on the globe is connected with England by swift subsidized mail steamship lines and an order by mail to England from any one of these countries receives prompt attention and England gets the lion's share of the world's business.

The United States cannot hope to compete with England or even France or Germany until it adopts the policy of those nations of subsidizing lines of swift mail steamers.

Trade certainly follows the flag, at least England, France and Germany have found it so and every one of these countries foster their oversea trade with subsidies. The mail ship is but the forerunner of the ocean tramp as when trade increases the mail ships cannot transport all the freight.

When will the United States wake up and reach out for its share of the world's trade by adopting the same methods which have been found successful by all the great European nations?

England, France and Germany each have subsidized mail steamship lines to North and South America and to China and Japan, in fact every ocean today is furrowed by their steamships, fostered by their governments, which are diverting business to Europe and away from the United States.

How long will the American people and the United States government continue to sleep?

RICHARD P. JOY,
(Detroit, Mich.)

London, Oct. 9, 1908.

NAVIGATION IN SAN FRANCISCO SCHOOLS.

The board of education of the city of San Francisco has decided to establish a class for the teaching of navigation and seamanship. It is to be located in the Humboldt evening high school and instruction is scheduled to begin Nov. 1. The board was actuated in its decision by requests from the naval militia, ship owners' association, merchants' exchange and board of trade.

Mr. John T. McMillan, for a number of years in the hydrographic office in this city, was appointed instructor of the class. Mr. McMillan, who is an Annapolis graduate, is particularly well qualified to instruct the class, his long service in the navy, as navigating officer, and his connection with the naval militia and hydrographic office, having fitted him for the duties of instructor, and he will begin his work with a good-sized class. Mr. McMillan hopes to secure from the board, within a short time, navigational instruments to be used in connection with the course, and he also intends to take his class on an occasional cruise with the naval militia.

FERRO-CONCRETE FOR SHIP BUILDING.

The following communication to the London *Times* on ferro-concrete for ship building, from Clark & Standfield, 11 Victoria street, S. W., London, is of interest to ship builders:

Sir:—The use of ferro-concrete for the construction of floating vessels as carried out by Signor Gabellini should be of such general interest that any other application of this material for kindred purposes may, we think, be worthy of record. One of the original claims of John Standfield's depositing dock was its ability to lift and put afloat monoliths of concrete. It was not, however, until it was understood how to make such monoliths float of themselves that anything came of the idea, and the first person to adopt it, as far as we are aware, was the engineer to the port of Barcelona, who utilized a small section of the depositing dock that we designed for that port for picking off the depositing stages, on which they were built, the ferro-concrete blocks which form the extension of the harbor at Barcelona. This was merely an adaptation of an existing dock to this purpose, but the result was quite successful; and recently the Japanese have decided to use this method in the construction of the quay walls for the new harbor at Kobe, and we have been requested by the bureau of finance to prepare drawings for a depositing dock with the special view of dealing with concrete blocks 120 ft. long by 26 ft. broad, and varying from 32 ft. to 41 ft. in height. The blocks will be molded on timber stagings built along the foreshore, and will be hollow, with sufficient displacement to float of themselves. When the ferro-concrete has matured, they will be lifted off the staging by the special depositing dock, taken into deep water, allowed to float off the dock by sinking the latter, and then towed to their destination. When in place, they will be forced to sink by admitting water into the interior, which is divided by bulkheads into separate compartments, so as to allow the sinking to be controlled. The ferro-concrete shells will then be filled up with coarser concrete, and probably the different blocks keyed together so as to form a monolith of the complete quay.

We venture to think that the depositing dock should prove far more suitable for the construction of buoyant ferro-concrete structures than the ordinary floating dock, as used by signor Gabellini. The former is not occupied the whole time the structures are being molded and matured, for they are built on timber piles along the foreshore, and one dock can serve almost any length of such staging, as but a few hours would be required for the whole operation of lifting the blocks off the staging and depositing them afloat.

In the present proposal for the Kobe quay walls, the layout would be for six ferro blocks in various stages of construction, and allowing three months for the molding and ripening of each block, the 79 blocks, which comprise the entire scheme, could be completed and deposited in

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about three and a half years by the aid of a single depositing dock; whereas with an ordinary floating dock, on which they would have to be built and ripened, it is evident that on the same basis it would take about 20 years to complete the same work, or require five docks to do it in the same time.

We are, Sirs, yours faithfully,

CLARK & STANDFORD,

11, Victoria street, S. W., Oct. 19.

Accidents of a Month.

The list of accidents for the past month published herewith, while an improvement over the list for the preceding month, is quite extensive and records several heavy repair jobs, as well as the loss of six lives, four on the little steamer Maggie Marshall and two by the capsizing of a scow. Two vessels were totally destroyed, the schooner Lizzie A. Law, which stranded in a storm on Lake Superior on Oct. 30 and was pounded to pieces before she could be released, and the steamer Peshtigo, which met with precisely the same fate on Round Island, Straits of Mackinac, on Oct. 24.

Four collisions occurred, viz.: Between the steamer Ariel and barge Energy, steamer Lyman C. Smith and barge McWilliams, steamers Mataafa and Sacramento, and between the steamers Venezuela and Peters. The most disastrous of these was the Mataafa-Sacramento collision at Duluth, in which the Mataafa lost an anchor and had her port bow badly smashed, while the Sacramento received a large hole in her port side and sank. After she was raised and temporarily patched up the Sacramento hit an obstruction which removed the patch and caused her to sink again in shallow water. She was again raised and after temporary repairs had been made was anchored in the outer harbor at Duluth, where she will probably winter.

The new steamer Daniel B. Meacham, which stranded on Point Isabella, Lake Superior, on Oct. 24, will undergo extensive repairs at the Ecorse yard of the Great Lakes Engineering Works. Eighty plates will have to be taken off the Meacham, and in addition to this she has a number of damaged frames and tank top. The repair bill will amount to approximately $75,000, which is the greatest of the season.

Other steamers affording heavy repair work are the Scranton, Canadian, Stephenson, E. B. Osler and barge Connelly Bros. Weather conditions were largely responsible for the injury to the lake fleet during the past month.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Oct. 5	Str. Pendennis White	Accident to air pump; stopped at Sault for repairs	Lake Superior.
Oct. 5	Str. Peshtigo	Grounded	Round Island, Straits of Mackinac.
Oct. 6	Scow	Capsized; two men drowned	Whitefish Bay.
Oct. 7	Str. M. C. Elphicke	Ran aground in fog; released	Buffalo breakwater.
Oct. 8	Str. Gilchrist	Stranded; released, uninjured	Middle Neebish.
Oct. 9	Str. Wm. Livingstone	Grounded; released, uninjured	Entrance to Conneaut Harbor.
Oct. 10	Str. Wm. H. Averill	Crashed into State street bridge, damaging it slightly; bow of steamer splintered	Chicago.
Oct. 12	Sand steamer Junior	Hit by Rush street bridge; entire upper works carried away; damage estimated at $1,000	Chicago.
Oct. 12	Str. Midland Prince	Struck obstruction, puncturing bottom plate and filling forward compartments; temporarily repaired	Middle Neebish.
Oct. 13	Str. John Mitchell	Grounded, owing to low water; released on Oct. 15 after lightering 700 tons	Entrance to Indiana Harbor.
Oct. 13	Ferry steamer Ariel	Collided with barge Energy; cabin pushed in on port side above water line	Detroit river.
Oct. 13	Bge. Energy	Collided with ferry steamer Ariel; not seriously damaged	Detroit river.
———	Str. Alexis Thompson	Grounded; released, uninjured	Sheboygan harbor.
Oct. 14	Str. Mataafa	Collided with steamer Sacramento; port bow badly smashed and anchor lost; temporarily repaired	Duluth harbor.
Oct. 14	Str. Sacramento	Collided with steamer Mataafa; hit a little forward of amidships and steered to bank where she sank; decks above water for entire length; raised and temporarily patched up; on Oct. 30 hit obstruction while unloading coal, causing patch to come off; towed into shallow water where she sank; raised and taken to dry dock	Duluth harbor.
Oct. 14	Str. Geo. H. Russel	Broke outboard shaft at stern post, lost end of shaft and wheel; picked up by steamer W. A. Hawgood and towed to Ashland where she unloaded her cargo	Lake Superior, off Manitou Island.
———	Bge. McWilliams	Hit by steamer Lyman C. Smith; considerably damaged	Lake St. Clair.
———	Str. Lyman C. Smith	Collided with barge McWilliams; not damaged	Lake St. Clair.
Oct. 14	Str. Leland	Main steam pipe broke; stopped at Amherstburg for repairs	Detroit river.
Oct. 15	Str. Saxon	Stranded in thick weather; released after lightering 100 tons	High Island Reef, Straits of Mackinac.
Oct. 15	Str. Wexford	Stranded in thick weather; released, uninjured	Round Island, Straits of Mackinac.
Oct. 16	Str. H. B. Smith	Grounded	Lorain.
Oct. 16	Sch. Golden Age	Stranded in heavy smoke; released after lightering 300 tons; not damaged	Au Sable, Lake Huron.
Oct. 16	Str. John Sherwin	Grounded; released, uninjured	Lorain.
Oct. 16	Str. J. N. Jenks	Ran aground; released, uninjured	Bar Point, Detroit river.
Oct. 17	Str. E. B. Osier	Ran ashore in thick smoke; released after lightering 700 tons; bottom forward badly damaged; forward compartments full of water	Gravel Island, North Channel.
Oct. 17	Ann Arbor car ferry No. 2	Stranded	Manistique harbor.
Oct. 17	Tug Alert	Ran on rock; lost shoe and was otherwise damaged	Livingstone Channel.
Oct. 18	Str. Siemens	Stranded in thick smoke; released, uninjured	Nine Mile Point.
Oct. 18	Str. S. M. Clement	Grounded; released after lightering 400 tons of ore	Lake St. Clair.
Oct. 20	Str. Maggie Marshall	Steam pipe burst, throwing off main valve; four members of crew killed	Lake Michigan, off Kenosha.
Oct. 20	Sch. Lizzie A. Law	Broke away from steamer Edward Hines in storm; crew rescued; pounded to pieces	Lake Superior, near Huron Island.
Oct. 20	Sch. Selden Marvin	Broke away from steamer Edward Hines in storm; later picked up again by the steamer in a scuttled condition	Lake Superior.
Oct. 20	Str. David W. Rust	Badly damaged by fire while lying at Lake Shore docks; cause unknown; loss on steamer and cargo estimated at $20,000	Toledo.
Oct. 20	Str. Pahlow	Caught in storm; lost considerable of lumber cargo	Lake Michigan.
Oct. 20	Bge. Delta	Caught in storm in tow of steamer Pahlow; lost considerable of her lumber cargo; leaked badly	Lake Michigan.

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Oct. 20	Str.	D. M. Clemson	Hit lighthouse crib while trying to enter harbor in a heavy sea; going broadside on; several plates broken just at water line; temporarily repaired; crib knocked out 4 in. — Ashtabula harbor.
Oct. 20	Str.	Geo. Stephenson	Stranded in smoke and storm; No. 2 and 4 tanks and engine room filled with water; pumped out and floated Oct. 23; large hole in bottom; temporarily repaired; docked at Toledo Oct. 28; 20 or more damaged plates — Bois Blanc Island, Sts. of Mackinac.
Oct. 20	Str.	G. Watson French	Grounded in smoke and storm; seacock in forepeak broke, filling it with water; out 3 ft.; released after lightering and being pumped out — Hay Point, Mud Lake.
Oct. 20	Str.	A. G. Brower	Ran ashore in storm; released, uninjured — Lake Michigan, near Sheboygan.
Oct. 21	Str.	R. P. Ranney	Grounded, owing to low water — Erie.
———	Str.	America	Wheel picked up sunken log; all buckets on wheel destroyed and rudder bent — Green Bay harbor.
Oct. 22	Str.	Scranton	Stranded in thick smoke; released Oct. 28 and temporarily repaired; large hole in bottom below engines; docked at Superior. — Point Isabella, Lake Superior.
Oct. 22	Str.	Frank Hecker	Struck obstruction; released — St. Clair river, near Port Huron.
Oct. 22	Str.	J. J. Sullivan	Stranded in smoke; lightered part of cargo and was released Oct. 24. — Inside of Buffalo breakwater.
Oct. 22	Str.	Philip Minch	Stranded in heavy weather and smoke; lightered 40,000 bu. of grain; released Oct. 24. — Inside of Buffalo breakwater.
Oct. 22	Str.	Francis L. Robbins	Ran ashore in storm; released after lightering — Grosse Point, Lake St. Clair.
Oct. 23	Str.	Canadian	Stranded in heavy weather; could not be released until Oct. 30, owing to rough weather; most of cargo lightered; out 3 ft.; forepeak and Nos. 1 and 2 tanks full of water and large leak under boilers; repaired at Collingwood. — Canoe Pt., St. Mary's river.
Oct. 23	Str.	Marquette	Ran on beach in storm; released. — Lake Michigan, near Kenosha.
Oct. 23	Str.	Caledonia	Sprung a leak while loading ore; went to Manitowoc dry dock for repairs — C. & N. W. dock, Escanaba.
Oct. 24	Str.	D. M. Clemson	Struck in storm; released herself — Pt. Au Pelee, Lake Superior.
Oct. 24	Str.	City of Genoa	Stranded in storm; out 18 in. forward; lightered 300 tons and was then released — McGulpin's Pt., Sts. of Mackinac.
Oct. 24	Str.	D. B. Meacham	Stranded in storm; crew taken off by Portage Lake life-savers; three compartments full of water; released Oct. 27 after lightering 2,000 tons; it required three tugs' hard pulling to get her off; docked at Ecorse yard of Great Lakes Enngineering Works; 80 plates damaged as well as number of frames and tank top forward pushed up; cost of repairs about $75,000. — Point Isabella, Lake Superior.
Oct. 24	Str.	Peshtigo	Stranded in storm; badly pounded owing to rough weather and on Nov. 3 reported almost broken in two; abandoned as total loss. — Round Island, Straits of Mackinac.
Oct. 24	Str.	Walter Vail	Stranded in storm; released on Oct. 29 after hard pulling; stopped at St. Ignace for repairs. — Round Island.
Oct. 24	Bge.	Connolly Bros.	Stranded in storm in tow of steamer Vail; released on Oct. 30 after considerable pulling; patched up at St. Ignace and equipped with a steam pump for her down trip. — Round Island.
———	Str.	G. R. Crowe	Ran ashore in storm; forward compartments filled with water; pumped out and released; temporarily repaired at Detour. — Near Detour, St. Mary's river.
Oct. 26	Str.	Wm. P. Snyder	Grounded; released herself, uninjured. — Erie, Lake Erie.
Oct. 26	Str.	Fred Mercur	Ran ashore in fog — Lake Ontario, near Cape Vincent.
Oct. 27		Lighthouse tender Amaranth	Ran aground — Belle Isle, Detroit river.
Oct. 27	Str.	Peters	Collided with steamer Venezuela; misunderstanding of signals given as cause; slightly damaged — Sheboygan harbor.
Oct. 27	Str.	Venezuela	Collided with steamer Peters; damaged to extent of $4,000. — Sheboygan harbor.
———	Str.	Langell Boys	Stranded; released after jettisoning several thousand feet of lumber. — Presque Isle, Lake Huron.
Oct. 27	Str.	City of New York	Ran ashore — Niagara river.
———	Str.	Odland	Ran aground; released by tug Whelan — Mutton Island, Thunder Bay.
Oct. 30	Str.	Elba	Stranded owing to low water; released after lightering 200 tons, uninjured — Bar Point, Detroit river.
Oct. 30	Str.	Midland King	Ran aground; released Nov. 4 after lightering part of her cargo. — Detour, Straits of Mackinac.
Oct. 30	Str.	Sacramento	Struck obstruction while unloading coal cargo; temporary patch which had been put on after her collision with the Mataafa on Oct. 14 loosened and she was towed into shallow water where she sank; raised and temporarily repaired; anchored in harbor, probably for the winter — Duluth harbor.
Oct. 31	Str.	J. J. McWilliams	Stranded owing to low water — Chicago river.
Nov. 1	Str.	Muskegon	Stranded; steam pipes broke; out 3 ft. forward; released after lightering 150,000 ft. of lumber; towed to Escanaba. — St. Martin's Reef, Green Bay.
Nov. 4	Str.	Business	Lost rudder in heavy weather; went to Kingston where new one was put on — Lake Ontario, near Oswego.
Nov. 5	Str.	Wexford	Struck south pier in entering canal; hole in starboard side 1 ft. wide and 6 ft. long above waterline; part of cargo lightered; temporarily repaired at the Sault — Canadian Canal, Sault.
Nov. 5	Sch.	Oscar Newhouse	Stranded while tied up at city dock; crew obliged to swim to shore; cargo of potatoes, valued at $2,775, lost. — Waukegan, Ill., harbor.
Nov. 5	Sch.	A. C. Maxwell	Cut in two and sunk with cargo of lumber by steamer R. W. England which struck her when her wheel chains fouled; England not injured — Sault river.
Nov. 5	Str.	Daniel J. Morrell	Lost anchor; stopped at Ashtabula for new one. — Lake Erie, off Ashtabula.
Nov. 6	Tug	T. C. Lutz	Broke down in midlake and stopped at Port Colborne for repairs; later docked at Buffalo — Lake Erie.
Nov. 6	Str.	Troy	Rammed Omaha dock, cutting a hole 6 ft. long into it. — Duluth.
Nov. 7	Str.	Owego	Pounded hard while out in storm; lost smoke-stack and whistle; stopped at Cleveland with shifted cargo and received new smoke-stack and whistle — Lake Erie.
Nov. 9	Str.	Rosemount	Grounded; out 2½ ft.; part of grain cargo lightered. — Hay Lake.

A public hearing will be held in the office of Col. John Millis, government enginer, Cleveland, at 11 o'clock A. M., Thursday, Nov. 12, 1908, to consider application of the Cleveland Terminal & Valley Railroad Co., under the federal laws relative to structures over navigable waters, etc., for authority to construct a lift bridge to replace present bridge over Cuyahoga river, Cleveland harbor. All interested are invited to attend, and it is preferred that any suggestions or objections be submitted in writing. Plans for the proposed structure may be seen at the engineer's office.

The Phoenix Construction Co., of New York, has been awarded contract for repairing and reconstructing a wharf and ferry landing at Governor's Island, N. Y., the consideration to be $6,500.

The Submarine Signal Co., Boston, Mass., has received a contract from the lighthouse inspector at Boston for supplying submarine bell signal apparatus for light vessel No. 90. The price of the installation is to be $1,300.

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THE DEVELOPMENT OF SHIPYARDS AND SHIP BUILDING INDUSTRY OF NIPPON.

BY HIRATA TAKATORI.*

The growth of the mercantile marine of the world since 1900 is not remarkable,—it is almost unbelievable, it is astounding.

Great Britain in 1900 built 696 ships of the aggregate tonnage of 1,374,585 In the same year the United States built 154 vessels, the total tonnage of which amounted to 207,345. Germany built 98 vessels of the aggregate tonnage of 227,898. France 55 ships of 69,933 tonnage. Nippon in the same year, built 101 vessels of a total tonnage of 21,766.

In 1907, the number of new vessels built by Great Britain and her colonies aggregated 2,014, amounting in tonnage to 1,845,305 tons. The United States built 177 vessels of the aggregate tonnage of 454,713. Germany 507 vessels, with a total tonnage of 321,372, and Nippon 148, with a total tonnage of 127,521. France 52 vessels, with an aggregate tonnage of 113,345.

The growth since 1900, in the case of Great Britain, shows the increase in vessels of 1,318 and in tonnage of 570,720. The United States, in 1907, shows the increase in the number of ships built over those of 1900 by 23, and in tonnage 247,368. As for Nippon, she built in 1907 only 40 more ships than in 1900, but mark the difference in the tonnage of the ships she built. She built 105,255 tons more than in 1900. Here is a difference.

In other words, in terms of tonnage Nippon built in 1907 about five times as much as she built in the opening year of the twentieth century,—five times.

The rise in living expenditure is causing a great deal of comment. But after all, it has only risen about 30 per cent at the most, within the seven years under review.

The ratio of the increase of the ship building industry is a little different; it is about 500 per cent.

This, then, is the place to which the ship building industry of Nippon has advanced. Beside it, the scandalous speed at which the taxation of New York City property is said to be climbing heavenward looks like a snail's pace.

There are many reasons for this stupendous growth in the ship building enterprises of the world. Taking the more important few, let us say first, that the center of the world's civilization in its ever Westward shifting, has actually sailed out of the Mediterranean, sailed over the Atlantic, and looks very much as if it has made the United States its temporary home. From the restlessness of it, also with its face toward the West, one is tempted to say that it will be swimming across the Pacific within a very short time. This shifting of the world's center of civilization, commerce, finance and political interests, naturally carried with it a tremendous activity along the development of resources which had remained untouched, and the development of resources in virgin territory forces, willy-nilly, the increase of transportation facilities. The construction of railways has brought about a new era for land transportation,—and a more striking, if not newer, period for water transportation.

With the shifting of the world's centers Westward, we seem to be tiptoeing now on the threshold of what might be called the Pacific era. The glories of the Atlantic are those of a sunset glow, and already a new sun is above the horizon of the new East. The course of the star of the empire of the school-boy is merely telling us a half of the story, for what of the eastward advance of Russia over the Siberian snows? What about the ever eastward march of England through Egypt, Persia, India, Burmah, Australia, and out upon the South China Sea at Hongkong? What also about the French crowding into the Empire of Cochin-China and dominating the treasure house of the South China? From the West and from the East, therefore, the world's center seems to be converging on what has been known as the Far East.

In the period that straddled the years of grace 1904 and 1905, in which history was made at a rapid pace from Port Arthur to Mukden, from the Yellow Sea to the Strait of Korea, —one Eastern power, for the first time, joined the household of great powers. The rise of Nippon and the wakening of China, the coming of the continent-island of Australia to her own, made the extreme East the center of the world's stage.

And the birth of the New East brought the world's greatest ocean into play, and for the first time in the history of mankind. Small wonder, therefore, that this period marks a new era in the history of the ship building and mercantile marine of the world in general, and of Nippon in particular.

A number of minor causes there are, also. The policy of great powers, and specially of the Nippon government, is to encourage the creation of merchant marine as an auxiliary to the navy. Subsidy, bounty, mail contracts, and every manner of government assistance, have entered into the upbuilding of the ship building and merchant marine enterprises.

Another cause: The passenger traffic of the steamship companies all over the world have abandoned the method of competing one against another, through low prices. Competition, especially in over sea passenger transportation business, is today carried on almost entirely through superior accomodations, by means of superior construction of ships, through the attainment of great speed, through the elegance and furnishings of the cabins also, and this method of competition for trade gave a tremendous impetus to the construction of more imposing ships of greater tonnage.

Still another: By no means the least of the chief reasons for the great advance of ship building interests in the world, was the policy adopted by Germany of late. On a fine day Germany quaffed a heady wine, and swore solemnly that she shall in the future dispute the supremacy of Great Britain as the ship builder and ship owner and mistress of four seas. And the aggressive policies of Germany in commanding the over sea transportation trade on all the waters of the globe, inaugurated what might be called a race in ship building and the maintenance of merchant marines between the two very great powers of the world.

Let us recall the history of the ship building industry of Nippon in the picturesque story—with more than a touch of the old time feudalism—of what is now known as the Mitsubishi Dockyard Company.

MITSUBISHI DOCKYARD. — Where the Pacific loiters down the evergreen aisle in its Sabbath peace and dignity, into perhaps the finest harbor in the Far East, called the Bay of Nagasaki, along the water front covering about two and one-half miles, stands today the dry docks and workshops of the Mitsubishi Dockyard Co. Two dry docks of the company have done a great deal of work in the past. The ships belonging to the Hamburg-American Steamship Co. of over 16,000 tons were repaired there. It was there that the Dakota and Minnesota of Mr. Hill's line were wont to receive such attentions as they needed.

The first of these docks is situated at a point called Azatagami, and the second is at the inlet of Azaaku. The third dry dock is in course of construction. It is being built at a point

*In the *Pacific Era*.

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called Azahachikenya; it is to be the greatest dry dock in the Far East.

As with so many great things, the Mitsubishi Dockyard Co. began in a very small way, and the beginning of it belongs to an ancient history, as the new order of things in Nippon goes. At first the dockyard was inaugurated by the Tokugawa Shogunate.

In the declining days of the Tokugawa Shogunate, Yokohama and Nagasaki were the two harbors which were opened for foreign commerce before all the rest. The appearance of many a stately ship from abroad at these two harbors was the first inspiration that gave restlessness and dissatisfaction to the shipping trade at Nippon. No longer would they look upon the one-mast wooden junk as quite satisfactory and sufficient unto their far sea dreams. It was in those days that the government of Holland presented a toy steamer to the Shogun. It was christened with the poetic name of Kwanko-Maru. When it was damaged, the necessity of establishing a repair shop arose, and so it came to pass that a Hollander called Hardes, who at the time was engaged in a famous Dutch factory at Deshima, was engaged to serve under the Shogunate and establish a new workshop fitted with sufficient machinery, for the purpose of repairing the small "Ship-That-Sees-the-Light." It was in the second year of Ansei (1855), and this little workshop was the forefather of the present Mitsubishi Dock, at the inlet of Aku. It was exceedingly modest, this dock, in the days of the Shogunate. It was entirely too small to claim even a passing glance of the ship building industry of the present day. The entire duty of this dock in the days of the Shogunate was simply to repair the Kwanko-Maru, and one or two other still smaller steamboats, which happened to be in the harbor of Nagasaki. After the fall of the Shogunate, and when the Meiji government came into power, the steamship tonnage of Nippon began to grow. Naturally the facilities for repair and construction of steamships increased as the days went by. The increase in the construction and repair of steamships compelled the Mitsubishi people to rebuild their workshops. They purchased another dockyard, which was called Kosuge, and finally succeeded in establishing the present Takami dock. But the ship building work of the Mitsubishi Dockyards in those days was not at all pretentious. The largest vessel they built in those days was a wooden vessel of 1,500 tons. This vessel was built in the days when the present Prince Ito was the Minister of the Department of Construction, and when Mr. Otori Keisuke, the present Baron Otori Keisuke, was the Chief of Bureau of Construction. In those days the Mitsubishi Dockyard still remained under the management of the Nippon government, and you can see the souvenirs of those days in the conventional chrysanthemum crest, which the government used to put upon all its workshops everywhere in those days, still retaining its imperial dignity on the stone fences of the Tategami dock.

Now the government enterprises, then as now, proved quite expensive without any perceptible profit. It was therefore on July 17, 1884, that the government-owned dockyard was leased to Baron Iwasaki Yataro, who was the president of the Mitsubishi Co. at the time, and for some years the Mitsubishi Co. tried to manage the docks under the lease. The lease, however, did not prove, either to the government or to the Mitsubishi people, satisfactory. It prevented the Mitsubishi interest from exercising the full measure of its judgment, did not afford it the liberty of constructing new dockyards, or expanding the old ones. So, three years later, in 1887, the government at last sold the property to the Mitsubishi Co. This was the time when Nippon was entering upon a new life. The country was about to be give a new constitution. All the industrial, economic, financial life of the country, as well as its political activities, were preparing themselves to receive new inspiration. One of the great necessities, the lack of which the country felt bitterly, was the ship building facility. Answering therefore to the wide-spread demand for the construction of new ships, in 1889, the Mitsubishi Dockyard contracted and succeeded in building the steel steamers for Osaka Shosen-kaisha. They were the Kisogawa-Maru, and the Chikugogawa-Maru, and the Shinanogawa-Maru. These steel steamers were built in the present Tategami shops and dock. By that time the Mitsubishi Co. had managed to acquire a certain amount of machinery and tools which were essential for the proper construction of a ship, but compared to what it is today, it was indeed in its infancy. And indeed, it should hardly be dignified by the name of a dockyard; it was simply a ship building shop whch tried its best with limited facilities.

The inevitable contest over the command of the four seas which had been in full play in the Mediterranean and the Atlantic, was beginning to invade the more distant seas. The waters of the Far East were then just beginning to feel the first hint of this active and strenuous struggle. Nippon was wakening in those days, without even pretending to be one of the great actors of the world-drama. Still, she was compelled, in a more or less degree, to take her part in the world movement, in doing what she could in augmenting the mercantile marine of the world. As the years went by the pressing demand for the increase of shipping facilities in the far eastern seas grew apace; Mitsubishi ship building enterprises had no lack of work. It was in 1894 that the Mitsubishi Co. felt an absolute necessity of extending ther facilities in building ships, and at last succeeded in extending the length of the Tategami Dockyard to 523 ft. Thus the first dockyard of the present was established. At the same time, it felt the necessity of building a new dock at the inlet of Aku. It was built with the length of 371 ft., and this is the second dock of the Mitsubishi Co. of the present time. With the establishment of this second dock, the Mitsubishi Co. established also a number of workshops surrounding it. Also the company increased the number of workshops which specialized in the manufacture and construction of different parts of a ship, and enlarged the scope and capacity of their work in every line. It was in those days that the Mitsubishi Co. established different departments of machinery, of putting different parts together, a workshop for filing purposes, boiler shops, and in addition to these they established a special factory for the manufacture of sails, for the manufacture of cast iron articles, for the wooden workshop, enlarged and re-built a number of blacksmith shops, and the electrical department. It was just about this time also that they began to use electricity for motive power. Also, they installed a three-legged steel chane which has the capacity of lifting a hundred tons, and connected different work shops and different departments of the dockyard with rail. This gave an entirely new aspect to the dockyard, also a new scope.

A little later on, they leveled the hill back of the Tategami Dock, and gained a good deal of space along the water front by filling in the shallow portion of the inlet near the shore, and upon this new-made ground, they placed a number of new workshops, such as machinery and blacksmith shops, and bath. It was upon this site also, that they housed a new depart-

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ment of the naval architects, for the drawing of ship plant, and so on. Also they filled up about 3,000 tsubo (one tsubo equals about four square yards) in the portion along the reef near the shore, and devoted this space to the gathering place of materials for the construction of ships. The general idea of the size of these different work shops could be gained by saying that the woodworking shop alone measures 468 ft. by 80 ft. Both at the inlet of Aku and at the Tategami, they have their own plant for generating electricity for the use of the shops, as well as for lighting purposes. From there, also, is furnished all the compressed air that is used all over the workshops. These two docks alone at the present time, afford a facility of building 20,000 tons of ships per year.

WRECKS OFF CALUMET HARBOR.

The United States lake survey has received a report from Major Thos. H. Rees, United States engineer in charge of the Chicago district, that remnants of car ferry barge No. 2 have been removed, and the wreck of the schooner David Dows has been partly removed.

The car ferry barge was sunk in June, 1907, 3⅛ miles 73° 45′ (ENE. 9/16 E.) from Calumet Harbor lighthouse, and was partly removed by the government in July and August of the same year. The sweeping operations of the lake survey steamer Search in August, 1908, disclosed that this wreck was then still a menace to navigation.

The wreck of the David Dows, with a clear depth of only 22 ft., lying 6⅜ miles 70° 30′ (ENE. ¼ E.) from Calumet Harbor lighthouse, was found and reported by the lake survey steamer Search in August, 1908.

CHICAGO NAUTICAL SCHOOL.

The Chicago Nautical School, Masonic Temple, Chicago, announces that its engineering classes during the ensuing season will be in charge of Frank T. Clarke, an engineer well known among the marine engineers of the great lakes. Besides being an associate member of the American Institute of Electrical Engineers, Mr. Clarke has had practical experience on the great lakes for a number of years. He was first assistant engineer on the "W. E. Corey," when that steamer was first placed in commission. Of recent years, he has been identified with the construction of large turbine stations in the east and west, and possesses a very complete knowledge of this class of machinery. Mr. Clarke and Lieut. Wilson, the principal of the school, have compiled a new set of lessons in engineering, greatly simplifying the course but without lessening its efficiency.

QUESTIONS FOR MASTERS AND MATES.—NO. 17.

250. Ship heading NNE½E by compass when simultaneous bearings of two objects were taken by the same compass; first object bore W by N, and second object bore SSW. Deviation of this compass on NNE is 6° Wly and 8° Wly on NE by N; Var. at place of ship 2½° Ely. What is the true course the ship is making and what are the true bearings of the two objects?

251. What should the bearing of the north star be by a compass having ½ point Wly Var., and no Dev.?

252. A ship making 11½ miles per hour and steering NW, took the bearing of a lighthouse at 9 A. M.; the bearing was W by N; run 22 minutes on course when this same lighthouse bore WSW. How far is the ship from the lighthouse and in which direction?

253. What is the difference in feet between 6,080 feet and the mean length of the nautical mile?

254. Explain the principle of the log-chip, line and sand-glass.

255. How many miles and in which direction is the north magnetic pole from the true pole? What is the direction of the north magnetic pole from the true north pole?

256. What is the first of several corrections to which the compass is subject?

257. Is variation of the compass a "correction" or an "error" of the compass?

258. Is it correct to say that one of the errors of the compass is its variation?

259. Is the variation the same at all places?

260. Is the variation the same at all times at the same place?

261. Does the variation change enough in several years to make any particular difference?

262. Which variation is increasing and which variation is decreasing?

263. In which direction is the line of no variation moving?

264. What is the cause of the annual change in the variation?

ANSWERS TO QUESTIONS FOR MASTERS AND MATES.—NO. 17.

250. True course NNE ⅛ E. First object bears W ⅝ N. Second object S x W ⅝ W.

251. N ½ E.

252. 4.2 miles ENE from the lighthouse.

253. 3.2 ft.

254. A log chip is a triangular piece of wood weighted on one edge so as to float vertically and secured to the logline by a bridle. It is dropped over the stern and remains stationary in the water while the log line is being payed out. The length of line run out as timed by the sand glass gives the ship's rate of speed. The logline is 150 fathoms long, and is marked into knots from the stray line mark, (a red rag). The speed is estimated in knots and tenths. When the logline is running out the sand glass is turned just as the stray mark passes over the rail, and when the sand has run out the logline is held. This jerks out a plug in the chip to which one part of the bridle is secured, causing the log to float horizontally. The last knot passing over the rail indicates the number of knots run in the time the sand was running from one compartment to another.

255. 1,200 miles south. South.

256. Variation.

257. A correction.

258. No.

259. No.

260. No, there is a small annual change.

261. Yes.

262. Easterly is decreasing. Westerly is increasing.

263. Westerly.

264. The magnetic poles change their position from year to year. The magnetic pole is moving to the westward or to the right, around the true pole.

Capt. D. C. Munro, of the schooner Oak Leaf, died at Gibraltar, Mich., at the age of 57 years.

The Canadian steamer Rosemont, bound down with coal, went aground in Hay Lake at the west entrance to the Neebish channel. She was released after 1,000 bu. of grain had been lightered.

The steamer Milinokett, which has been laid up in Duluth harbor, has been chartered for winter storage of coal screening. At the Berwind-White coal dock there is a great pile of coal dust which is not salable at present. The dock is already crowded and the company has chartered the steamer to load and hold the screenings for the winter, hoping to dispose of it when work starts up next spring. Dock men say that this is the first time that a vessel has been chartered for such a purpose.

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ATLANTIC COAST NOTES.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The number of arrivals of vessels at the port of New York during the month of October was 841, of which 350 were from foreign ports and 491 domestic.

The new steamship Duca di Genova, of the Florio Rubbattino company, arrived at the port of New York last week on her maiden voyage. The new vessel is the fourth ship of this type in the line, and was built by Captiere Navale di Maggiorno, Spezia, Italy. She is 450 ft. in length, beam 51 ft., and of about 8,000 gross tons. She is propelled by two sets of quadruple-expansion engines, and on her trial maintained a speed of 16 knots.

The Clyde liner Mohawk arrived at New York last week from Philadelphia, and is now in service between New York and Jacksonville. The Mohawk was built at the Cramp shipyards, Philadelphia, is 400 ft. in length, of 48 ft. beam, and of 5,000 tons register. She has accommodations for 275 cabin and 60 steerage passengers, and is luxuriously fitted throughout. She will average a speed of 14 knots.

The steamer H. M. Whitney, of the Metropolitan Line, while en route for Boston last week, grounded in Hell Gate, off Steep Rock, and suffered considerable injury to her bottom. Immediately after grounding she drifted to the southern entrance of Little Hell Gate, where she remained partly submerged. Her crew of 23 men escaped uninjured.

The Austrian steamship Maria arrived at New York last week with the captain and crew of the three-masted schooner R. D. Spear, who were picked up about 450 miles southeast of Sandy Hook, having left the vessel leaking heavily and in a sinking condition. The R. D. Spear hailed from Eastport, Me., and had a cargo of 500 tons of coal.

Last week 8,265 steerage passengers crossed the Atlantic, westbound, the eastbound movement numbering 8,285.

The five-masted schooner Governor Ames arrived at Boston on Nov. 4, 35 days out from Newport News. The captain reported having encountered unusually severe weather, during which the vessel sprang a leak and necessitated the constant working of two steam pumps. When picked up the master and cook of the vessel were the only members of the crew fit to work, the others being unable to leave their berths. For 10 days they had been without water and had had nothing to eat but stale bread.

Information has been received at Boston of the abandonment at sea of the schooner Frank Barnet, of Boston, which sailed from there on Oct. 27 for Brunswick. The French steamer Massila, which arrived at New York recently, reported having passed a burning schooner derelict, and picking up in the vicinity one of the boats of the Frank Barnet. The crew of the Barnet were rescued and landed at Port Antonio.

The steamer Favorite has been sold to Philadelphia capitalists and will be placed in commission to run between Tampa and St. Petersburg, Fla., immediately.

The fleet of United States lightships and tenders, which were built at Camden, N. J., for use on the Pacific, have arrived at Montevideo. They will proceed for Valparaiso, via the Straits of Magellan.

The Norwegian steamship Hermes, which arrived at Philadelphia last week from Wabana, N. F., reported passing a monster iceberg when 200 miles east of Cape St. Francis. It would seem that floating ice still exists in the North Atlantic, though out of the track of the liners.

The four-masted schooner Charles G. Endicott arrived in Hampton Roads last week with the body of her deceased master, Capt. Marvin Bailey, of Manasquan, N. J. The captain was washed overboard from the Endicott off Cape Hatteras, on Oct. 31, was rescued, but died from exhaustion and shock. His body was sent home.

Messrs. Hartfield, Solari & Co., agents of the new Italian Line between Philadelphia and the Mediterranean, last week announced the successful launching of the steamship Ameriac. The vessel is of 12,000 tons displacement, 500 ft. in length, and has been specially constructed for the traffic of passengers between Genoa, Naples, Philadelphia and New York. She will accommodate 100 first class, 70 second class, and about 2,000 steerage passengers.

BOOK REVIEWS.

Internal Combustion Engines: Their Theory, Construction and Operation. By R. C. Carpenter and H. Diederichs. 597 pages. D. Van Nostrand Co., New York. Price $5.00, net.

The subject of this work is too vast to be covered thoroughly within the limits of the volume under review, but the authors have made a creditable effort. Its treatment is highly technical, and as a consequence the work is one which will scarcely appeal to a large circle of readers, notwithstanding the increasing popularity of the combustion engine. It is emphatically a work for students and presupposes a more than ordinary familiarity with mathematics. Naturally the thermodynamics of the gas engine claim a large share of attention, and this in turn involves consideration of the various fuels, gasoline and other oils; alcohol, illuminating, producer, coke-oven, blast-furnace and natural gas, etc. These chapters occupy a greater portion of the book. No particular practice in design is considered, nor structural details, although examples of modern construction in various types are freely cited. It is to be regretted that in this respect many of the illustrations are decidedly inferior, and others have been reduced so that details are indistinguishable. As a work of reference on the gas engine as a means of converting heat into work it is valuable, as is to be expected from the standing of the authors; the designer is assumed to be competent to supply the mechanical means of application.

The repair job on the steamer Daniel B. Meacham, now in dry dock at the Ecorse yard of the Great Lakes Engineering Works, will be one of the heaviest of the season. Nacey & Hind, of Cleveland, will supervise the repairs on behalf of the owners.

A new company known as the Thunder Bay Elevator Co. has been organized at Winnipeg for the purpose of building an elevator at Port Arthur with a capacity of 1,500,000. The stockholders are associated with the Empire Elevator Co., which has a plant at Fort William.

In the blow on Lake Erie last week the package freighter Owego of the Union Steamboat Line was quite badly shaken up. She put into Cleveland with her smoke stack and whistle gone and with a shifted cargo. She was repaired at Cleveland.

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TRADE NOTES.

The American Brake Shoe & Foundry Co., 405 Western Union building, Chicago, is sending out on request an illustrated folder in which are listed the various machinery parts cast by them from manganese steel for use in gold, silver, copper, lead, zinc, iron and coal mines, smelters, quarries and chemical works. This company also makes high carbon, specially treated steel castings for mining machinery, and is prepared to furnish vanadium, chrome, nickel and chrome-nickel steel castings as well.

The W. S. Rockwell Co., 50 Church street, New York, has issued pamphlet No. 1 describing the Rockwell crucible melting furnace. This furnace is adapted to use with various metals and either oil or gas fuel may be used. The folder gives a good description of its advantages together with a table of standard sizes, and is well illustrated with half tones and wash drawings. The company will gladly send the pamphlet on request.

The Smooth-On Mfg. Co., of Jersey City, N. J., has issued the seventh edition of its Smooth-On Instruction Book, containing 96 pages of valuable information about Smooth-On iron cement, sheet packing and corrugated steel gaskets and showing when, where and how to use them. The catalog is well illustrated with half tones and drawings and besides containing price lists of the various Smooth-On products gives many excellent testimonials from well-known users. A request will bring it to you.

The Scott Electrical Co., 58 Nassau street, Newark, N. J., is distributing upon request a pocket-size booklet describing the Scott flaming arc lamp. The unique features of these lamps are that they may be made to produce any desired color of light, such as violet, red, orange, etc., and for the same cost of current the makers claim that the Scott light gives from 10 to 12 times the light yielded by the ordinary arc lamp. Various styles of different candle powers can be supplied by the company, all of which are described in this interesting booklet.

A. P. Lundin, of the Welin Quadrant Davit Co., has just issued a leaf to be inserted in their new catalog which is one of the most sumptuous ever issued, giving the latest installations of the davit. These include a number of ships now building, notably the Cleveland of the Hamburg-American line and the George Washington of the North German Lloyd. The list also includes a revenue cutter for the United States government as well as a steamer for the Japanese government, showing the very wide range of installations.

The plant of the Kingsford Foundry & Machine Works, Oswego, N. Y., which has operated full time during the past year on internally fired and marine boilers, report that from present indications they will have a very busy winter, as many inquiries are received and during the past week orders for five marine boilers have been placed.

The Bird-Archer Co., 90 West street, New York, is distributing an attractive 48-page treatise on Boiler Troubles and Their Prevention. The book is of excellent typographical appearance, being printed in two colors and judiciously illustrated with half tones and drawings, all of which provide an appropriate setting for a very interesting talk concerning boiler compounds, the action of feedwater impurities or oil and grease within the boiler, corrosion, methods of feeding boiler compounds, and hints about blow-off valves. The Bird-Archer compounds are sold under a very comprehensive guarantee and seem by their popularity to have justified their manufacturer in offering it. The book will be sent to all inquirers.

The Northwestern Expanded Metal Co., 930-950 Old Colony building, Chicago, has issued the second of its series of booklets describing the uses of expanded metal in its various forms. This one is an instructive treatise concerning reinforced concrete buildings and should be in the hands of every one contemplating the erection of any such structure. As in the case of the preceding booklet this one gives some valuable tables covering the use of concrete and steel and the manufacturer volunteers the services of its engineering department to architects, engineers and concrete workers as it wishes to co-operate with them as fully as possible. The entire series will be forwarded as they come from the press to those who send in addresses for filing.

The Fort Wayne Electric Works, Inc., Fort Wayne, Ind., has issued Bulletins No. 1110 and 1111, the first of which describes and illustrates in eight pages its Standard Multiphase switchboard panels, and the latter treats of electric motor drives applied to machine tools. There are 24 pages, of which 17 are devoted entirely to half tone and wash drawings, illustrations of the various types of the company's motors as applied to many different machines. The remaining pages are given over to a description of the advantages of electric power for machine tools as against any system of power transmission and to a brief but comprehensive statement of the characteristics of this company's motors, both of the direct and alternating current types, all of which are illustrated very plainly by photographs. These bulletins are issued from time to time by the company and are pierced for preservation on the loose-leaf binding system. They will be sent upon request.

REMOVING WRECK OF STEAMER GULF STREAM.

Bids for removing wreck of steamer Gulf Stream, lying sunk at entrance to Hereford Inlet, New Jersey, opened at United States engineer office, Wilmington, Del., by Captain L. H. Rand, corps of engineers, United States army

Name and address of bidder.	Price.
1. Merritt & Chapman Derrick & Wrecking Co., 17 Battery Place, New York	$9,860.00
2. Van Sant & Gandy, Atlantic City, N. J.	4,682.00
3. Napoleon B. Register, Lewes, Del.	3 813.00
4. Eugene Boehm, Atlantic City, N. J.	1.512.00
5. Johnston & Virden, Lewes, Del.	1,540.00
6. Frank R. Jones, Wilmington, Del.	4,400 00
7. Jesse A. Gray, Philadelphia, Pa.	1,950.00

Contract awarded to Eugene Boehm, Atlantic City, N. J.

BIDS FOR BUILDING WHARF.

Bids received by the lighthouse engineer for the district for the construction of a new revetment and wharf at the St. Joseph, Mich., lighthouse depot, were as follows:

*Columbian Construction Co., Muskegon, Mich.	$13,463.16
Edward Gillen Dock, Dredge & Construction Co.	19,376.39
Great Lakes Dredge & Dock Co., Chicago, Ill.	20,416.45

*Accepted.

BIDS FOR REPAIRING VESSEL.

Bids received by the lighthouse inspector at Baltimore, Md., for effecting repairs to light vessel No. 71, were as follows:

*Spedden Ship Building Co., Baltimore, Md.	$2,748
The Marine Railway, Machine & Boiler Works, Baltimore, Md.	2,823
Oliver Reeder & Son, Baltimore, Md.	2,874

*Accepted.

BIDS FOR DREDGING TUCKERTON CREEK, NEW JERSEY.

Bids for dredging Tuckerton creek, New Jersey, opened at United States engineer office, Wilmington, Del., Oct. 30, 1908, by Capt. L. H. Rand, corps of engineers, United States army:

Name and address of bidder.	Price per cu yd.
1. River & Harbor Improvement Co., Philadelphia, Pa.	33c
2. Rickards Dredging Co., Philadelphia, Pa.	28c

BARGE CANAL AWARD.

Superintendent of Public Works F. C. Stevens on Oct. 13 awarded contract No. 61 to E. M. Graves, of Cleveland, O., for the construction of a section of the Erie canal near Brockport, Monroe county, on a bid of $1,047,994, as against the engineers' estimate of $1,000,219.

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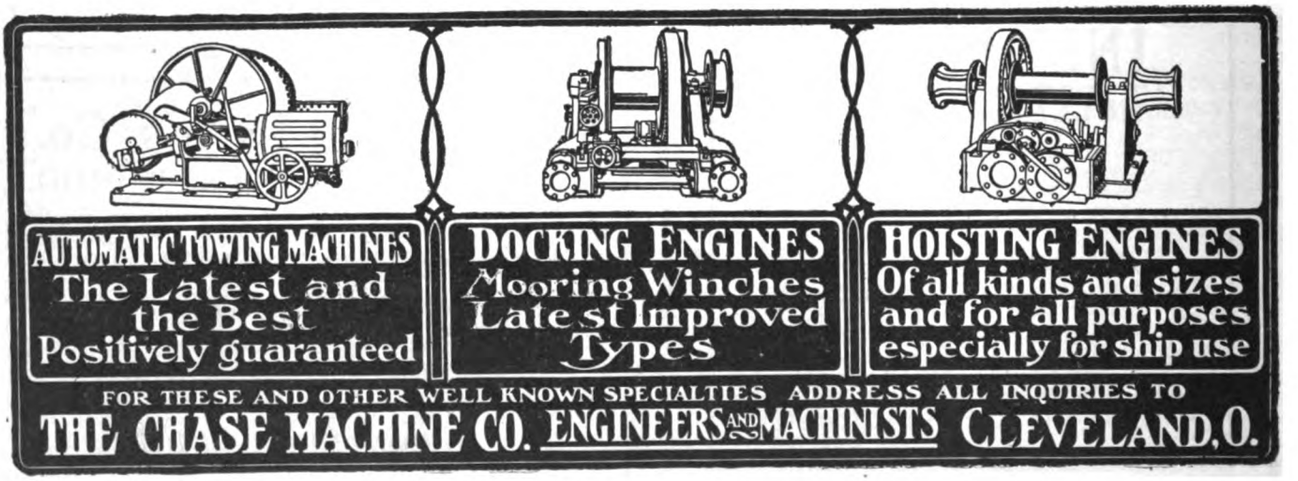
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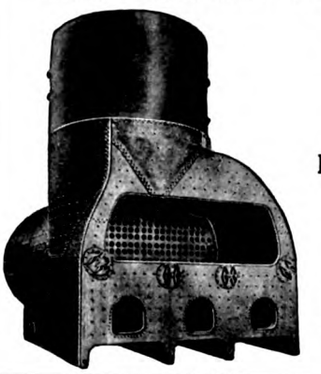

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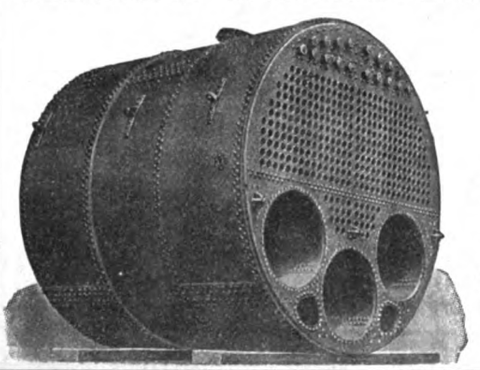

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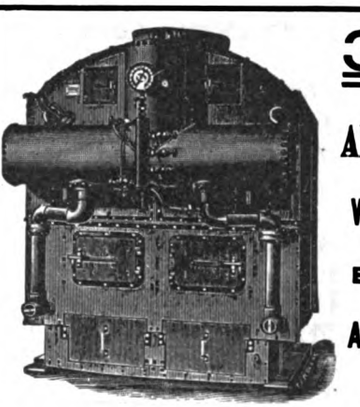

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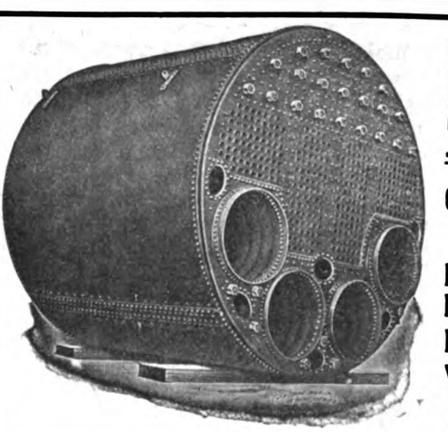

MARINE
BOILERS

OF ALL TYPES

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PROPOSALS FOR SIDE HAUL RAILWAY DRY DOCK.—Mississippi River Commission, Liggett Building, St. Louis, Mo., Oct. 24, 1908.—Sealed proposals for constructing side haul railway dry dock will be received here until 12 noon, standard time, Nov. 28, 1908, and then publicly opened. Information furnished on application. G. R. LUKESH, Capt., Eng'rs, Sec'y.

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